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FERRATA.

Page 112, line 8.—For *Exurtema connanum* read *Exurtema cornanum*.

Page 112, line 8. --For "*connutana*" read "*cornutana*."

Page 113, line 3.—For *connanum* read *cornanum*.

Page 121, lines 18, 26, 29.—For pectin read pecten.

Pages 162-163.—The collector for the new subspecies and new species on page 162, and for the first new species on page 163, should be added, namely, J. T. Duce.

PROCEEDINGS OF THE
ENTOMOLOGICAL SOCIETY OF WASHINGTON

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No. 1

**ON ENTOMOLOGICAL PUBLICATIONS OF THE UNITED STATES
GOVERNMENT.**

By J. S. WADF,¹

U. S. Bureau of Entomology.

The subject matter which follows is presented at the direct request of a number of the writer's associates, and because rather intimate contact in recent years with many of them in some of their struggles with Government publications has led to the belief that a brief resume of some of the various series of Federal entomological publications might prove of value to the fraternity. Lest some one should feel, however, that, like Holmes' Katydid, he "saith an undisputed thing in such a solemn way," it may be added that much of the discussion which follows is avowedly elementary in character. It is intended primarily for the use of beginners or "near-beginners" in entomology who are desirous of building up small working libraries. It is hoped that the data will be more especially useful to those who labor in isolated localities far removed from large libraries or centers of entomological research, or whose opportunities for association with fellow workers may be of a limited character.

It is realized that much of the matter presented here may be quite familiar to some of our older and more experienced entomologists. However, in view of the intellectual struggles of some of those who do have access to good libraries, when they are in what Dickens terms "the agonies of composition," or while they may be endeavoring in limited time to run down elusive references, or to discover what has been recorded on a given subject, or to gain information concerning the issuance or scope of new or old "Government bulletins," it seems possible that at least a portion of the present discussion may prove helpful even to them as well. The scope of this paper is largely limited to a review of such publications as are of sufficiently recent date to be of greatest usefulness, and the acquisition of which would be within the bounds of reasonable possibility.

Says Dr. G. Stanley Hall, "One of the best things we can do for others is tell them what books we read." In discussing a subject of this kind, a very real difficulty is to refrain from too much generalization or wandering too far afield, or delving

¹ Read at the 346th regular meeting of the Society on February 2, 1922.

into almost every phase of the subject in which a book-loving antiquary might possibly be interested. It is realized that this subject as a whole could be expanded with profit far beyond the limits set by the writer's time and ability. It might therefore be well at the outset to state that no attempt is here made to exhaust the subject or to furnish more than a mere humble contribution to it. The facts presented have been brought together bit by bit, merely through the possession for a long time of a sympathetic interest in certain forms of bookish lore, and an oracular knowledge of the subject is not assumed. Grateful and appreciative acknowledgment is gladly rendered to Miss Mabel Colcord, Librarian of the U. S. Bureau of Entomology, for much information furnished and to Dr. L. O. Howard, Mr. W. R. Walton, Mr. Rolla P. Currie, and Mr. S. A. Rohwer, of the Bureau of Entomology, and to Mr. F. J. P. Cleary, of the Division of Publications, for many helpful suggestions.

A large portion of the North American literature on entomology has been published through various channels by the United States Government. Probably foremost among these agencies are (a) the United States Department of Agriculture, (b) the Smithsonian Institution, (c) the United States National Museum, (d) the U. S. Department of Interior, Reports of the various Scientific Explorations, Geological Survey publications, (e) the Treasury Department, Public Health Service, (f) the War Department, Library of the Surgeon-General's Office.

Millions of copies of Governmental publications have been, and are distributed by the issuing departments and by Congress, free of cost to those making application for them, while a few of such publications, like certain of those issued by the Smithsonian Institution and Geological Survey, are sold at prices covering the mere cost of paper and printing. A number of the older (and some of the more valuable) of them are now out of print, and can be obtained only through dealers in natural history publications.

Even a hasty perusal of the lists of documents issued through these channels will prove to the most prejudiced mind that the much abused "Public Documents" (or, as they were formerly called, "Government books") include, along with much prosaic and unreadable matter, thousands of interesting papers of permanent scientific or historical value. Among such works are the annual reports of the executive departments and their subordinate bureaus, reports of explorations and surveys of vast unexplored areas of the American continent, and up-to-date information about the latest invention, discovery, or pest, and statistical matter of all kinds, and these frequently contain matter of highest interest and importance. This heterogeneous mass of congressional and executive publications, with its vagaries and idiosyncrasies is well known, and to say the least,

interesting to the student. The Government of the United States employs thousands of scientists, who are engaged constantly in research and investigation. Such activity includes researches in all branches of agriculture and household economy, irrigation, forestry, as well as medicine, aviation, engineering, astronomy, chemistry, electricity, mining, geology, and manufactures. The recorded results of all these activities in the form of public documents are "poured out in an incessant flood from the Government Printing Office at Washington, the largest printing plant in the world."

Unfortunately, only a few of the Government publishing offices systematically preserved for posterity a complete file of their own publications, and it is, therefore, small wonder that general lists or indexes, especially to the earlier documents, have been so few and of so unsatisfactory a character. As there are about 250 branches of the Government which at times issue documents, the best informed citizen or official may be pardoned for not being familiar with most of them. It is of interest in this connection occasionally to read comments on the lack of human interest, the general prolixity, and the form of issue of some of these publications. For illustration, Clark in "The Use of U. S. Government Publications," says: "Examine the report of an executive department or of an important bureau of a date before 1906. There will be found, first, the few brief pages of the report of the chief officer—like the short, swift upward shoot of a skyrocket, expanding at its end into a fiery display that overspreads the whole heavens; or in the case of the report, into a concatenation of appended exhibits, tables, sub-reports, and sub-sub-reports that swell the whole into a bulky volume."

It is one of the functions of the Office of the Superintendent of Documents of the Government Printing Office in Washington to act as a general bureau of information for citizens in all parts of the country who desire knowledge as to the various public documents, but who do not know where or how to address the numerous departments, bureaus, surveys, commissions, committees, services, boards, officers, and divisions by which the various documents are published. The more important bibliographical aids for research work among public documents are as follows:

Anon: "Index to documents and reports, House of Representatives, 1789-1839." Congressional documents (Serial No. 104, 85, part 2, 209, part 2, and 350).

Anon: "Consolidated index of executive documents of the House of Representatives 26th to 40th Congress." Congressional documents 1386, 1387.

Poore, Ben: Perley: "Descriptive catalogue of Government publications of the United States, September 5, 1774-March 4, 1881." 1885, 1932 pages, folio, Washington (Serial No. 2268).

Crandall, F. A.: Check list of public documents, debates and proceedings from 1st to 53d Congress (1789-1895). Washington, 1895.

Ames, Dr. J. G.: Comprehensive Index of publications of United States Government, 1889-1893. 1894.

Ames, Dr. J. G.: "Comprehensive Index to publications of United States Government 1881-1893." 2 vols., quarto (Serial No. 4745-4746). 1905.

Hickcox, J. H.: "United States Government Publications, a monthly catalogue," Vols. 1-10, 1885-1894.

"Monthly catalogue of United States public documents." Issued by the Superintendent of Documents. This catalogue, published since 1895, lists all the publications of the Government published during each month, giving prices of all which are available for sale, with an annual index issued separately.

"Catalogue of public documents." Vol. 1, 53d Congress, March 4, 1893, to Vol. 12, 63d Congress, June 30, 1915. This series is called in the law a "Comprehensive Index." It is a catalogue of all the publications authorized during one Congress, or for a period of two years beginning with July 1. The arrangement is "dictionary style," that is, in one alphabet a book, pamphlet or article may be located by author, by Government bureau responsible for it, or by subject; all the more important publications are analyzed.

"Document index." Vol. 1. 54th Congress, 1st session, Dec. 2, 1895, to Vol. 25, 65th Cong., 1st session, October 6, 1917. This series is the "Consolidated Index" provided for by the printing law of 1895 and is issued following each session of Congress. It lists only the numbered documents and reports issued by direct order of Congress, but these it treats very thoroughly. The titles may be found in the general alphabet, also under the titles of the Committees from which they were reported, and again under the names of the Senators or Representatives by whom they were presented; they appear also in numerical lists. At the back of the book is a schedule of the volumes of numbered Congressional documents and reports.

"Check list of United States public documents, 1789-1909; Congressional, to close of 60th Congress, and departmental, to end of calendar year 1909." This is a list of all the documents published by the Government during 121 years, classified by Department, bureau, and series. "This," says Clark, in his *Guide to Use of U. S. Government Publications*, "is a bibliography which, for exactness and accuracy, admirable system and completeness, is a model of its kind, a monument to the experts of the Documents Office where it was compiled, and with which no other nation in the world, so far as the writer's information goes, can show for its government publications anything to compare in excellence and value."

U. S. Department of Agriculture:

The idea of the Department of Agriculture originated in the early activities of the Smithsonian Institution. Its actual growth began, however, through voluntary distribution of seeds which was begun by the Commissioner of Patents in 1836 and which continued until 1854, during which time its work was

mostly in connection with the distribution of seeds and the procuring of agricultural statistics. In 1854 a specific appropriation was made by Congress for the agricultural work of the Patent Office, and it was in that year an entomologist, Townend Glover, was first employed. The agricultural work was separated from the Patent Office in 1861, and its chief officer was styled "Commissioner of Agriculture." He did not become a member of the President's Cabinet until 1889, when his rank was raised to "Secretary of Agriculture."

The "Annual Report" on Agriculture began in 1837 with a two-page statement in the report of Henry L. Ellsworth, Commissioner of Patents. From that date to 1861, the "Annual Report" formed a part of the report of the Commissioner of Patents, making a separate volume for 1849. In 1862 the "Annual Report of the Department of Agriculture" was established and this was issued uniformly up to 1889. From that year until 1893 the document was entitled "Annual Report of the Secretary of Agriculture." Beginning with 1894 (in accordance with paragraph 2, section 73 of the printing Act of January 12, 1895) the report subsequently has been prepared in two volumes. One of these, known as the "Annual Reports of the Department of Agriculture," contains the Secretary's Report and the purely executive reports of the several chiefs of bureaus, divisions and offices, and is issued in limited edition. The other volume is known as the "Yearbook of the Department of Agriculture" and embraces the Secretary's Report, duplicated in the previously mentioned volume, and a collection of special articles, popular and semipopular in character, on agricultural science.

Though one of the youngest of the executive departments of the United States Government, and in spite of the fact that its work had been for years impeded by lack of interest on the part of Congress, the Department of Agriculture ranks second to none both in the number and in the usefulness of its publications. Beginning as a doubtful experiment with an Annual Report as its publication, the Department has gradually developed into a great publishing office, the output of which is eagerly sought by those engaged in all phases of agriculture and its related scientific activities. The almost constant changes which have occurred both in organization and personnel of many of the various divisions composing the Department, and the rapid growth of the organization as a whole explains in a large measure the confused method or lack of method and almost incomprehensible peculiarities which notoriously have characterized the publications emanating from many of the various bureaus and offices of the Department. In dealing with a collection of publications often of a highly technical character, differing widely in their subject matter, and issued under an unnecessarily complicated

system, or oftentimes painfully without system or method, it becomes a matter of the utmost difficulty to assemble or analyze such of these as are of interest to the entomologist. For example, the presence of meaningless or unsuitable titles such as "A Few Facts from Florida," or "A Popular Experiment," may be used as examples of one of the many phases of the difficulty to be encountered in dealing with them.

The publications of the Department to date include approximately 5,000 books, pamphlets and circulars of from one to 3,600 pages, some of which contain as many as 50 or more distinct papers. The greatest drawback to the systematic classification and use of these for ready reference has been found in the vast number of miscellaneous unnumbered publications. Further, there appears to have been no precise definition of either "bulletin" or "circular" as applied to such documents. The unnecessary multiplication of numbers on the title pages of some of the older publications of the Department, is also a matter which does not lend itself to easy explanation, if indeed there ever was any reason for that which forms a confused jumble of unintelligible characters appearing on the title pages of so many departmental pamphlets.

Curiously enough the Department itself does not appear to possess anything like a complete file of its own valuable literature. The Library of the Department has a fair representation of such publications, while most of the scientific bureaus retain files of at least the latest editions of their own work, but there is not to be found in any one place, or in all these libraries combined, a complete file of everything thus far issued. The following list comprises the principal series issued by the Department prior to July 1, 1913:

Office of the Secretary: Annual reports; Yearbooks of the Department of Agriculture; Monthly reports; Special reports; Miscellaneous special reports; Reports; Miscellaneous reports (unnumbered); Farmers' Bulletins; Circulars; Miscellaneous circulars; Miscellaneous circulars (unnumbered); Separates from yearbook; Reports of Appointment Clerk. *Division of Accounts and Disbursements:* Annual Reports; Miscellaneous publications. *Office of Fiber Investigations:* Annual reports; Reports; Miscellaneous reports. *Section of Foreign Markets:* Annual reports; Miscellaneous reports; Bulletins; Circulars. *Silk section:* Annual reports; Miscellaneous reports; Bulletin. *Division of Agrostology:* Annual reports; Miscellaneous reports; Bulletins; Circulars. *Bureau of Animal Industry:* Annual reports of the chief; Annual reports of the Bureau; Separates from Bureau of Animal Industry reports; Miscellaneous reports; Bulletins; Circulars. *Division (later Bureau) of Biological Survey:* Annual reports; North American Fauna; Miscellaneous reports; Bulletins; Circulars. *Division of Botany:* Annual reports; Contributions from the United States National Herbarium (to 1902); Miscellaneous reports; Bulletins; Circulars.

Section of Seed and Plant Introduction: Inventories; Circulars. *Division (later Bureau) of Chemistry:* Annual reports; Miscellaneous reports; Bulletins; Circulars. *Division (later Bureau) of Entomology:* United States Entomological Commission: Reports; Bulletins; Annual reports; Special reports; Miscellaneous reports; Bulletins (old series) (new series) (Technical series); Circulars (first series) (second series); Insect Life. *Office of Experiment Stations:* Annual reports; Experiment Station Record; Miscellaneous reports; Separates from Office of Experiment Stations publications; Bulletins; Miscellaneous bulletins, Circulars. *Division of Forestry (later Forest Service):* Annual reports; Miscellaneous reports; Bulletins; Circulars. *Division of Gardens and Grounds:* Annual reports; Miscellaneous reports; Circulars. *Office of Irrigation Inquiry:* Annual reports; Miscellaneous reports; Bulletins. *Library:* Annual report; Miscellaneous report; Bulletins. *Division of Microscopy:* Annual reports; Special reports; Food products. *Bureau of Plant Industry:* Annual Reports, Bulletins, Circulars, Documents. *Division of Pomology:* Annual reports; Reports of the Pomologist; Miscellaneous reports; Bulletins; Circulars. *Division of Publications:* Annual reports, Document and folding room; Annual reports; Miscellaneous reports; Bulletins; Lists. *Division of Illustrations:* Annual reports. *Office of Road Inquiry:* Annual reports; Miscellaneous reports; Bulletins; Circulars. *Seed Division:* Annual reports; Special agent for distribution of seed. *Division of Soils:* Annual reports; Miscellaneous reports; Bulletins; Circulars, Field operations. *Division (later Bureau) of Statistics:* Annual reports; Miscellaneous reports; Monthly reports (old series); Special reports (old series); Monthly reports (new series); Synopses of the Monthly Crop Reports; Bulletins (miscellaneous series); Circulars; Monthly crop circulars; the Crop Reporter. *Division of Vegetable Physiology and Pathology:* Annual reports; Miscellaneous reports; Bulletins; Circulars; Journal of Mycology. *Weather Bureau:* Annual reports; Special reports; Miscellaneous publications; Reports (data volumes); Bulletins (numbered); Bulletins (lettered); Storm bulletins; Circulars (numbered); Circulars (Instrument Division, formerly Instrument Room); Climate and Health; Monthly Weather Review; River and flood service; The Great Lake charts.

Prior to the establishment of the Division of Entomology, all official articles of entomological interest were published in the agricultural reports of the Patent Office. Such articles may be located by consulting the "General Index of the Agricultural Reports of the Patent Office for 1837-1861, and of the Department of Agriculture for 1862-1876," issued by the Commissioner of Agriculture in 1876. The Division of Entomology was established in 1863 and Prof. Townend Glover was appointed as its first entomologist. An interesting and sympathetic account of the life of this eccentric individual together with a complete bibliography of his published works by Charles R. Dodge may be found in U. S. Division of Entomology Bulletin (Old Series) No. 18 issued in 1888. The official reports of Glover as entomologist cover the years 1862 to 1877 inclusive,

and were published each year as part of the Annual Report of the Department. In the year 1877 the United States Entomological Commission was founded by an Act of Congress. It first was placed under the administration of the United States Geological and Geographical Survey of the Territories (Hayden Survey) of the Department of the Interior, (hereinafter discussed), but on March 3, 1881, was placed under the Department of Agriculture. The members of this commission were Dr. C. V. Riley, Dr. A. S. Packard, and Dr. Cyrus Thomas. The work of the Commission primarily was to investigate the ravages of the Rocky Mountain locust or Western grasshopper, a pest which had caused great losses to many kinds of growing crops in some of the more newly settled Western states from 1874 to 1876. Studies were made, however, of a number of other insect pests and the final results were published in five reports 1877 to 1890 inclusive and seven bulletins 1877 to 1881 inclusive. The first and second reports of the Commission were published under the direction of the Hayden Survey, and the remainder under the Department of Agriculture. The bulletins numbered 3 to 7 inclusive were published under the direction of the Interior Department. None of the bulletins was issued by the Department of Agriculture. While much of the matter to be found within these reports and bulletins is of permanent scientific value, it is regretted that all of them are now out of print, and only stray copies may be found now and then in the old book shops. Probably the most rare as well as the most valuable of the entire series is the fifth report by Dr. A. S. Packard, on "Insects Injurious to Forest and Shade Trees."

Because of the failing health of Prof. Townsend Glover in 1878, Dr. C. V. Riley was appointed entomologist to succeed him, and the official entomological report for that year was issued by him. He resigned after one year's service and was succeeded by Prof. John Henry Comstock who issued the reports of the entomologist for the years 1879 and 1880, and also a voluminous report on cotton insects in 1879. After two years Dr. Riley again became the official entomologist and from 1881-2 to 1893 inclusive, the annual reports of the entomologist were issued by him. Since the resignation of Dr. Riley, June 1, 1894, all annual reports, beginning with that for 1894, have been issued by his successor, Dr. L. O. Howard, the present Chief of Bureau. Prior to 1894 these annual reports contained much research matter, life-history studies, etc., with maps and illustrations. Subsequent to that date, however, the scope of reports has been limited to brief resumes of the main administrative work of the Division (later Bureau) and all technical papers were reserved for publication elsewhere. Beginning with 1894 and since then these reports have been published in the "Annual Reports of

the Department of Agriculture," and as author's separates, although those for 1894 and 1895 were not published separately.

The first series of Bulletins issued by the Division of Entomology, popularly known as the "Old Series," comprised 33 bulletins numbered consecutively from 1 to 33 inclusive, and these appeared from 1883 to 1895 inclusive.

The second series of Bulletins, popularly known as the "New Series," was begun in 1896 and appeared until 1913, during which time 127 numbers in 240 parts were issued. A complete list of these numbers and parts is as follows:

1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, parts 1, 2, 3, 4, 5, Contents and Index, 59, 60, 61, 62, 63, parts 1, 2, 3, 4, 5, 6, 7. Contents and Index, 64, parts 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, Contents and Index, 65, 66, parts 1, 2, 3, 4, 5, 6, 7, Contents and Index, 67, 68, parts 1, 2, 3, 4, 5, 6, 7, 8, 9, Contents and Index, 69, 70, 71, 72, 73, 74, 75, parts 1, 2, 3, 4, 5, 6, 7, Contents and Index, 76, 77, 78, 79, 80, parts 1, 2, 3, 4, 5, 6, 7, 8, Contents and Index, 81, 82, parts 1, 2, 3, 4, 5, 6, 7, Contents and Index, 83 part 1, 84, 85, parts 1, 2, 3, 4, 5, 6, 7, 8, Contents and Index, 86, 87, 88, 89, 90, parts 1, 2, 3, Contents and Index, 91, Index, (No. 91 also issued as a Congressional document under the number House Document 977, 62d Cong., 3d Sess.), 92, 93, 94, parts 1, 2, Contents and Index, 95, parts 1, 2, 3, 4, 5, 6, 7, Contents and Index, 96, parts 1, 2, 3, 4, 5, 6, Contents and Index, 97, parts 1, 2, 3, 4, 5, 6, 7, Contents and Index, 98, 99, parts 1, 2, Contents and Index, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, parts 1, 2, 3, 4, 5, 6, 7, Contents and Index, 110, 111, 112, 113, 114 (as Senate Document No. 305, 62d Congress, 2d Session), 115 parts 1, 2, 3, Contents and Index, 116, parts 1, 2, 3, 4, 5, Contents and Index, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, parts 1, 2, Contents and Index.

The U. S. Division (and Bureau) of Entomology Bulletins of the Technical series were issued from 1895 to 1913, (1915) and comprise 27 numbers in 62 parts, and were issued as follows:

Nos. 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, parts 1, 2, 3, 4, 5, 6, 7, 8, 9, Contents and Index, 13, 14, 15, 16, parts 1, 2, 3, 4, 5, 6, 7, Contents and Index, 17 parts 1, 2, Contents and Index, 18, 19, parts 1, 2, 3, 4, 5, Contents and Index, 20 parts 1, 2, 3, 4, 5, 6, Contents and Index, 21, 22, 23, parts 1, 2, Contents and Index, 24, 25, parts 1, 2, Contents and Index, 26, 27, parts 1, 2, Contents and Index.

The Circulars of the U. S. Division of Entomology known as the first series were nearly all circular letters, many of them without date and the number published "exceeded forty." Only three of these are known to exist.

The Circulars of the Division of Entomology known as the Second Series were issued from 1891 to 1913 and comprise 173

numbers, number 100 of the series being an index to the numbers previously issued. The publications within this series were nearly all semipopular in character and were designed for distribution to correspondents, and to those people not sufficiently trained to make most efficient use of the more technical matter contained in the various other series.

Probably the periodical publication of the Department which has been of the greatest interest to entomologists was that known as "Insect Life." Volume 1, No. 1 of this publication was dated July, 1888, and the last number issued was Volume 7, No. 5, and was dated July, 1895. A comprehensive index to the seven volumes was prepared by the Department under the supervision of Dr. F. H. Chittenden, and this greatly enhances the usefulness of the set. It was published in 1897. A few scattered numbers of *Insect Life* may still be obtained by purchase from the Superintendent of Documents, but complete sets are now rather scarce, and may be obtained only from dealers in natural history books. The set was issued at infrequent intervals and numbered irregularly. The complete series consists of the following numbers:

Vol. 1, Nos. 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12; Vol. 2, Nos. 1, 2, 3, 4, 5, 6, 7 & 8, 9, 10, 11 & 12; Vol. 3, Nos. 1, 2, 3, 4, 5, 6, 7 & 8, 9 & 10, 11 & 12; Vol. 4, No. 1 & 2, 3 & 4, 5 & 6, 7 & 8, 9 & 10, 11 & 12; Vol. 5, Nos. 1, 2, 3, 4, 5; Vol. 6, Nos. 1, 2, 3, 4, 5; Vol. 7, Nos. 1, 2, 3, 4, 5; General Index to the series.

There also have been issued a number of miscellaneous publications which originated in the Division of Entomology, but which were published in a numbered series of the Secretary's office or of some other office of the Department, or as separate publications distinct from any series. Probably the more noteworthy of these are the "Bibliography of the more important contributions to American Economic Entomology," by Henshaw and Banks, parts 1 to 8 inclusive, issued 1889 to 1905; the "Report on Cotton Insects," by J. H. Comstock, already mentioned; "Reports on Insects Affecting the Orange," by H. G. Hubbard, issued in 1885; "Insects Affecting the Cotton Plant," by Dr. L. O. Howard, issued in 1896; certain papers relating to forest insects by Dr. A. D. Hopkins and by Dr. F. H. Chittenden issued through the then Division (later Bureau) of Forestry; "The Common Crow of the United States," by W. B. Barrows and E. A. Schwarz, issued as Division of Ornithology and Mammalogy Bulletin No. 6, in 1895; and various papers dealing with insecticide experiments prepared in collaboration with, and issued through, the Bureau of Chemistry, from 1902 to 1908. There also exist a few unimportant publications issued

through the Division of Entomology, Silk Section, from 1889 to 1890. This section was discontinued June 30, 1891.

On July 1, 1913, a radical change in the system hitherto in use for the issuance of the publications of the Department was inaugurated, and practically all of the series herein mentioned which were being issued at that date were discontinued. However, there were at that time a number of unfinished parts and indexes to bulletins of the Bureau of Entomology that were added subsequently, the latest (certain indexes to bulletins of the Technical series) being published as late as 1921.

Under the plan of publication adopted July 1, 1913, all publications of the Department of Agriculture issued since that date may be classified as follows:

(1) Annual Reports.—These consist of such publications as the annual reports of the various bureaus, divisions, and offices, which, in connection with the Annual Reports of the Secretary, constitute the volume entitled "Annual Reports of the Department of Agriculture." This is a continuation of the series begun in 1862. Under the title as quoted, it has been issued since 1894. In addition to these, annual reports of bureau operations were prepared under the law, by the Weather Bureau, since 1891, and a volume has been issued annually since 1899 entitled "Field Operations of the Bureau of Soils." Of these various publications, the "Yearbook of the Department of Agriculture," already described, issued since 1894, is perhaps the most popular, 500,000 copies being printed annually, 470,000 of these reserved for distribution by senators, representatives and delegates in Congress, and the remaining 30,000 for distribution by the Department. This number is of course insufficient even for the Department's own employees and for volunteer cooperators. Each of these Yearbooks contains one or more entomological articles which are also issued as separates. A few copies of back volumes of the Yearbook may be obtained on application to Members of Congress and most of them may be purchased from the Superintendent of Documents.

(2) Department Bulletins.—These bulletins contain the popular and semitechnical papers which, prior to July 1, 1913, had been published in the bulletin or circular series of the various bureaus, divisions and offices; practically all these latter series having been discontinued on that date. These bulletins are designed to discuss the results of various investigations by the Department, each bulletin usually being confined to a particular subject. Some of these are designated as "Professional Papers," although the usage of the term is not uniform. These are intended for free distribution by the Department so long as its supply lasts; and after that applicants are referred to the Superintendent of Documents, who has all numbers not now out of print for sale under the law of 1895. The publications

issued within this series are numbered consecutively beginning with Number 1, irrespective of the subject of the individual papers. Unfortunately no Bureau or subject subnumber has been added to indicate the sequence of any paper in the series with any other paper on the same subject issued before or after it, from the same issuing office. Therefore it is impossible, in the absence of such subnumber, for the entomologist who does not have before him a complete list of all the titles issued to date or a list of the numbers thus far issued on entomology, to ascertain how many and what particular numbers refer to publications on the subject. It is obvious that the addition of a subject subnumber at the beginning of the publication of the series would have rendered the bulletins of this series much more easy of consultation by both entomologists and librarians. The following is a complete list of the numbers within this series pertaining wholly or in part to entomology, or to some phase of the work of the Federal Horticultural Board, which have been issued to January 1, 1922.

5, 8, 14, 15, 19, 45, 59, 76, 78, 81, 88, 90, 92, 93, 95, 96, 100, 101, 104, 107, 111, 112, 113, 116, 118, 120, 124, 131, 134, 145, 147, 156, 160, 161, 163, 165, 167, 170, 171, 173, 184, 186, 189, 192, 197, 200, 204, 221, 226, 227, 231, 233, 235, 239, 243, 245, 247, 248, 250, 251, 252, 254, 255, 256, 259, 260, 261, 262, 263, 264, 265, 273, 275, 276, 278, 280, 286, 289, 293, 295, 325, 329, 333, 344, 345, 351, 352, 358, 363, 364, 366, 368, 377, 382, 408, 416, 417, 419, 421, 422, 424, 427, 429, 431, 432, 435, 436, 437, 438, 443, 451, 480, 484, 489, 491, 513, 535, 536, 539, 550, 553, 554, 564, 566, 571, 597, 598, 599, 609, 616, 619, 621, 640, 643, 645, 647, 671, 685, 689, 703, 707, 708, 723, 730, 731, 732, 734, 737, 746, 750, 766, 771, 774, 778, 779, 780, 783, 785, 787, 795, 796, 804, 805, 807, 808, 809, 810, 812, 824, 826, 828, 833, 834, 837, 838, 841, 843, 847, 866, 872, 875, 885, 886, 887, 888, 889, 892, 893, 899, 900, 901, 902, 903, 907, 911, 914, 918, 922, 926, 932, 938, 959, 964, 965, 966, 967, 986, 988, 992, 1008, 1016, 1035.

(3) *Journal of Agricultural Research*.—A portion of the more strictly scientific and technical matter published in the Bureau bulletins and circulars prior to July 1, 1913, appears, under the later plan of publication, in the *Journal of Agricultural Research*. This was distributed free only to agricultural colleges, technical schools, experiment stations, libraries of large universities, Government depositories, and to such institutions as make suitable exchange with the Department. It was not for free, popular distribution to individuals, but is for sale by direct purchase of past issues, or by subscriptions for the then current issues from the Superintendent of Documents. Volumes 1 to 4 of the *Journal of Agricultural Research* were published monthly, volumes 5 to 16 weekly, volume 17 monthly, volumes 18 to 21 inclusive semimonthly. Beginning with volume 22 the issue

was weekly. Under a provision of the Sundry Civil Act of March 4, 1921, Government departments were required to suspend publication of all periodicals except those receiving the approval of Congress, by December 1, 1921. A resolution empowering the Congressional Joint Committee on Printing to authorize the continuance or discontinuance of these periodicals, among them the *Journal of Agricultural Research*, passed the Senate but did not come to a vote in the House before the adjournment of the 57th Congress, 1st Session. The *Journal* was therefore suspended with the issue of December 3, volume 22, No. 10, until its continuance is authorized by Congress. Each paper published in the *Journal* was also issued as a numbered separate, the series for each issuing office of the Government and for each State being preceded by a letter; for instance the contributions on entomology from the Federal Bureau of Entomology are known as the "K" series. It should be borne in mind, however, that all contributions in the *Journal* on entomology are not to be found within the "K" series, as such contributions, when issued from State experiment stations (or, as in the case of New York State, from a particular institution, notably Cornell or Geneva) were then arbitrarily placed under the letter for such State. As such usage also applies to all other subjects designated by the other letters, this renders the finding of desired papers under any of the series exceedingly complex and difficult. The following is a complete list of the *Journal* separates pertaining wholly or in part to entomology, or some phase of the work of the Federal Horticultural Board, issued to date of publication of this paper:

K-1 to 103 inclusive, G. 2, 5, 6, 17, 18, 23, 28, 31, 33, 34, 36, 41, 64, 83, 121, 129, 135, 190, 203, 219, Maine, 3, 13, Kans. 2, 11, Mont. 1, 3, 4, 5, 8, Mo., 1, 2, N. Y. (Cornell) 2, 4, N. Y. (Geneva) 4, N. J. 4, Va. 1, Va. (Norfolk) 3, A-32, Ala. 1, Calif., 4, 12. F-7, 17, Ky. 4, Minn., 2, 7, 15, 16, 17, 21, 24, 28, Oreg., 1, 2, 3, N. C., 3, 10, O., 1, 2.

(4) *Miscellaneous Periodicals*.—These, in addition to the *Journal* already indicated, consist of the following:

"Experiment Station Record," v. 1, 1889-90 to v. 45, No. 8, Dec. 1921. Index vols. 1-12 inc., and 13-25 inc. issued by the States Relations Service. This is a technical review of the world's scientific literature pertaining to agriculture.

"Weekly News Letter," v. 1, Aug., 1913, to v. 9, No. 19, Dec. 7, 1921, and "Monthly List of Publications," issued by the Division of Publications. The former discontinued Dec. 14, 1921. Superseded by "The Official Record," v. 1, No. 1, Jan. 4, 1922.

"Public Roads," issued by the Office of Public Roads.

"Monthly Crop Reporter," v. 1, No. 1, May 10, 1915, to v. 7, No. 12, Dec. 1921, by Bureau of Crop Estimates.

"Monthly Weather Review," "Climatological Data for the United States," and "Snow and Ice Bulletin," (the latter weekly during winter), issued by the Weather Bureau.

"Service and Regulatory Announcements," issued at irregular intervals by the Federal Horticultural Board.

All of these publications, with the exception of the "Monthly List of Publications," are issued in rather limited editions, and are not for popular distribution, though they can be obtained on application by Government and State officials or may be purchased at cost of publication from the Superintendent of Documents. The inhibitory provisions of the Sundry Civil Act of March 4, 1921, also apply to the "Weekly News Letter," the "Monthly Crop Reporter," and "The Experiment Station Record."

(5) Farmers' Bulletins.—This is the most popular series of publications of the Department, and the pamphlets are designed for the widest possible distribution. They vary in size from four to thirty-two pages, or more, dealing in a popular way with a subject, and give clear, positive nontechnical directions for doing things. The demand for these has been so great that the Department has found it necessary to reprint many of the numbers many times. Most of the earlier numbers between 1 and 400 are now out of print, and can only be obtained by purchase from the Superintendent of Documents, or from some dealer in second-hand books. Quite a number of the bulletins within this series deal wholly or in part with entomological subjects and specific reference thereto may be found by consulting an "Index to Farmers' Bulletins, numbers 1 to 1000," an octavo volume of 812 pages issued by the Department in 1920. The following comprises a complete list of the Farmers' Bulletins issued from 1892 to January 1, 1922, dealing wholly or in part with entomology, or with some phase of the work of the Federal Horticultural Board:

7, 13, 19, 26, 33, 38, 39, 45, 47, 53, 54, 59, 61, 70, 76, 80, 82, 87, 92, 94, 99, 114, 118, 120, 127, 129, 130, 132, 133, 137, 140, 145, 146, 148, 153, 155, 156, 159, 161, 163, 165, 169, 171, 172, 173, 174, 177, 178, 189, 190, 191, 196, 204, 209, 211, 212, 216, 217, 220, 223, 225, 227, 231, 232, 243, 244, 247, 255, 258, 259, 261, 262, 264, 267, 275, 276, 281, 282, 283, 284, 288, 290, 296, 302, 305, 307, 309, 313, 314, 319, 320, 322, 324, 334, 339, 341, 343, 344, 353, 354, 356, 374, 378, 387, 388, 390, 397, 412, 415, 416, 418, 422, 424, 427, 431, 433, 434, 435, 436, 439, 440, 442, 443, 444, 447, 450, 453, 455, 456, 457, 459, 460, 463, 467, 476, 478, 479, 480, 482, 484, 485, 488, 489, 492, 493, 495, 497, 498, 500, 501, 503, 504, 506, 512, 513, 517, 527, 528,

530, 532, 537, 540, 543, 547, 549, 557, 564, 569, 571, 580, 582, 587, 595, 598, 603, 605, 606, 607, 609, 611, 613, 618, 621, 624, 625, 626, 627, 630, 634, 636, 637, 639, 640, 642, 648, 649, 650, 653, 657, 658, 659, 662, 668, 671, 674, 675, 679, 681, 683, 684, 685, 690, 691, 693, 694, 695, 699, 701, 705, 708, 711, 713, 714, 721, 722, 723, 725, 731, 733, 734, 735, 736, 737, 739, 740, 741, 744, 747, 750, 752, 754, 755, 759, 760, 762, 763, 766, 770, 772, 776, 778, 784, 789, 791, 793, 798, 799, 801, 804, 819, 831, 835, 837, 843, 844, 845, 846, 848, 851, 856, 857, 860, 862, 867, 868, 872, 875, 880, 890, 891, 897, 902, 908, 909, 912, 914, 915, 923, 926, 928, 933, 940, 942, 944, 950, 954, 957, 959, 961, 971, 975, 980, 982, 983, 994, 1003, 1006, 1007, 1011, 1012, 1014, 1017, 1020, 1024, 1025, 1029, 1031, 1037, 1038, 1039, 1041, 1046, 1056, 1057, 1061, 1065, 1070, 1074, 1076, 1083, 1084, 1085, 1086, 1090, 1094, 1097, 1098, 1101, 1102, 1104, 1110, 1126, 1128, 1140, 1147, 1148, 1154, 1156, 1158, 1162, 1169, 1177, 1180, 1185, 1188, 1190, 1193, 1197, 1198, 1203, 1206, 1217, 1220, 1225, 1237, 1239, 1246.

(6) Department Circulars.—This series is comparable to the Farmers' Bulletin series, except that it contains a greater number of publications issued under special conditions for emergency purposes. The entomological numbers are:

35, 40, 79, 154, 162, 163, 167, 172, 201, 210, 216, 218.

(7) Circulars, Office of the Secretary.—The few articles within this series pertaining to entomology have been brief and popular in scope, and it now seems unlikely that future articles on the subject will appear in this series. Those on entomology are:

Nos. 37, 40, 51, 55, 61, 87, 127.

(8) Reports, Office of the Secretary.—Most of the articles pertaining to entomology which have appeared within the series of numbered Reports, Office of the Secretary, are technical or descriptive papers such as hitherto appeared in the Bureau of Entomology Technical Series. Those on Entomology are:

Nos. 51, 57, 74, 78, 99, 101, 102, 107 and 108.

Contrary to popular notion, there is not maintained by the Department any general mailing list of persons who receive all of the publications issued, as such system would be an inexcusably wasteful and unsatisfactory method of distribution. Instead, there is issued the "Monthly List of Publications," to which reference already has been made, about the first of each month through the Division of Publications, and this is sent regularly to all who make application to that office for it. From this list, information may be obtained as to what has been pub-

lished during the month and how to obtain it. In requesting these publications, it should be emphasized, that in making application one should not request everything on the list merely because it happens to be free, for a limited number of bulletins carefully studied are of much greater service than a bulky file of several hundred numbers placed on one's shelves, and then forgotten.

The following bibliographical works, in addition to those already enumerated, will supply detailed information as to what has been published on various subjects, including entomology, by the Department since its organization down to and including the publications issued under the new system inaugurated July 1, 1913.

- 1888—Schwarz, E. A. et al. "An enumeration of the published synopses, catalogues, and lists of North American insects." U. S. Division of Entomology. Bulletin (Old Series) No. 19. 77 pages.
- 1889—Henshaw, Samuel. Bibliography of American economic entomology, U. S. Department of Agriculture. Division of Entomology. Part 1. The more important writings of Benjamin Dann Walsh. 49 pages. Part 2. The more important writings of B. D. Walsh and C. V. Riley. Part 3. The more important writings of C. V. Riley. 454 pages.
- 1892—Riley, C. V. Directions for collecting and preserving insects. U. S. National Museum Bulletin No. 39, part F. Bibliography, pp. 131-147.
- 1895—Henshaw, Samuel. Bibliography of American economic entomology, Department of Agriculture, Division of Entomology. Part 4, The more important writings of Government and State entomologists, and of other contributors to the literature of American economic entomology. A-K. 167 pages.
- 1896—Anon. List of publications of the United States Department of Agriculture from 1841 to June 30, 1895 inclusive, 76 pages.
- 1896—Anon. Index to the Annual Reports of the United States Department of Agriculture, from 1837-1893 inclusive, United States Department of Agriculture, Division of Publications Bulletin No. 1, 252 pages.
- 1896—Henshaw, Samuel. Bibliography of American economic entomology. Department of Agriculture, Division of Entomology. Part 5. The more important writings of Government and State entomologists, and of other contributions to the literature of American economic entomology. L-Z. 179 pages.
- 1897—Thompson, G. W. & Hill, G. W.—Synoptical index of the Reports of the Statistician, 1863-1894, U. S. Department of Agriculture, Division of Publications Bulletin No. 2, 258 pages.
- 1898—Banks, Nathan.—Bibliography of American economic entomology. Department of Agriculture, Division of Entomology. Part 6. The more important writings published between June 30, 1888, and December 30, 1896. 273 pages.
- 1898—Thompson, G. W., & Hill, G. W.—Index to authors with titles of their

- publications appearing in the documents of the U. S. Department of Agriculture, 1841-1897, 303 pages.
- 1900—Banks, Nathan.—A list of works on North American entomology, compiled under the direction of the entomologist for the use of students and other workers as well as for those about to begin the collection and study of insects. U. S. Department of Agriculture. Division of Entomology Bulletin (New Series) No. 24. 95 pages.
- 1901—Anon.—Catalogue of the periodicals and other serial publications exclusive of U. S. Government publications in the Library of the U. S. Department of Agriculture, U. S. Dept. of Agriculture Library Bulletin No. 37, 362 pp. 1907. Supplement No. 1, 1901-1905, 217 pages.
- 1901—Banks, Nathan.—Bibliography of American economic entomology. Department of Agriculture. Division of Entomology. Part 7. The more important writings published between December 31, 1896, and January 1, 1900. 113 pages.
- 1902—Handy, R. B., & Cannon, M. A.—List by titles of publications of the United States Department of Agriculture, from 1840 to June, 1901, inclusive. U. S. Department of Agriculture, Division of Publications No. 6, 216 pages.
- 1904—Anon.—Bibliography of United States public documents, Departmental List No. 1, List of Publications of the Agricultural Department 1862-1902 with analytical index, prepared in the Office of the Superintendent of Documents, 623 pages.
- 1905—Banks, Nathan.—Bibliography of American economic entomology. Department of Agriculture, Bureau of Entomology. Part 8. The more important writings published between December 31, 1899, and January 1, 1905. 132 pages.
- 1906—Anon.—Catalogue of publications relating to entomology in the Library of the U. S. Department of Agriculture. Prepared under the direction of the Librarian, U. S. Department of Agriculture, Library Bulletin No. 55, 562 pages.
- 1909—Anon.—List of periodicals currently received in the Library of the U. S. Department of Agriculture, arranged by title and by subject. Department of Agriculture Library Bulletin No. 75, 72 pages.
- 1909—Banks, Nathan.—Directions for collecting and preserving insects. U. S. National Museum Bulletin No. 67. Bibliography pp. 127-131.
- 1910—Banks, Nathan.—A list of works on North American entomology, compiled under the direction of the entomologist for the use of students and other workers, as well as for those about to begin the collection and study of insects. U. S. Department of Agriculture, Bureau of Entomology, Bulletin (New Series) No. 81. 120 pages.
- 1910—Colcord, Mabel.—List of publications of the Bureau of Entomology, U. S. Bur. Ent. Cir. (New Series) No. 76, 32 pages.
- 1912—Anon.—Catalogue of publications relating to forestry, in the Library of the U. S. Department of Agriculture, U. S. Dept. Agr. Library Bulletin 76. 302 pages.
- 1917—Banks, Nathan. Index to the literature of American economic entomology, Jan. 1, 1905, to Dec. 31, 1914. American Association of Eco-

conomic Entomologists, Melrose Highlands, Mass. Special publications 1. 323 pages.

1918—Anon.—United States Department of Agriculture Division of Publications. List of Farmers' Bulletins by subjects. 7 pages.

1919—Anon.—U. S. Department of Agriculture publications available for distribution, revised to July 1, 1919. 234 pages.

1921—Anon.—U. S. Department of Agriculture publications available for distribution revised to June, 1921. 170 pages.

The 1919 publication contains an alphabetical index to all publications available for free distribution at date of issue and of those no longer for free distribution, but which may be obtained from the Superintendent of Documents. It also has a numerical list of the Departmental publications issued since July 1, 1913, and a complete list of Farmers' Bulletins with all out of print numbers indicated. The latest edition of this publication is sent free on application to any one by the Division of Publications.

1921—Colcord, Mabel.—Index II to the literature of American economic entomology, Jan. 1, 1915, to Dec. 31, 1919. Amer. Asso. of Econ. Entomologists, Melrose Highlands, Mass. Special Publication 2, 388 pages.

The following price lists of the Superintendent of Documents will furnish detailed information as to the prices of available Departmental publications:

Nos. 11-9th Ed.; 16-14th Ed.; 20-9th Ed.; 36-10th Ed., 38-12th Ed., 39-7th Ed.; 40-8th Ed.; 41-11th Ed.; 42-10th Ed.; 43-13th Ed.; 46-13th Ed.; 48-9th Ed.; 68.

It is inexpedient to attempt any hard and fast, invariable distinction between the Government publication which is free, and that for which a charge is made. The supply of a particular document may be exhausted one month, and then be renewed by reprinting the next month, a charge being made in the meanwhile for those for sale out of the reserve stock by the Superintendent of Documents; or the free supply may never be renewed, with the result that such documents, originally free, will thereafter rank as sale publications.

United States Smithsonian Institution:

The Smithsonian Institution, Washington, D. C., was created by an Act of Congress on August 10, 1846, in accordance with the Will of James Smithson, an English scientist, who bequeathed the reversion of an estate amounting to \$515,169.00

to the United States Government to "Found in the City of Washington an institution for the increase and diffusion of knowledge among men." It is the policy of the Institution to "increase knowledge" by stimulating men of talent to make original researches through the offering of suitable awards for memoirs containing new truths, and devoting annually a portion of the income for practical research under the direction of suitable persons, "to diffuse knowledge." Detailed information regarding the origin, scope of work, and publications may be obtained by consulting a volume entitled "The Smithsonian Institution, Origin & History, 1835-1889," by Wm. J. Rhees, issued in 2 volumes as Smithsonian Miscellaneous Collections No. 1035 and 1036. It is the policy of the Smithsonian Institution, first, to publish a series of practical reports on the progress of the different branches of knowledge, and second, to publish occasional separate treatises on subjects of general interest.

The serial publications of the Smithsonian Institution are as follows:

1, Smithsonian Contributions to Knowledge: This is a quarto series of original memoirs embracing the records of extended original investigations and researches; it was begun in 1848 and now comprises 35 volumes.

2, Smithsonian Miscellaneous Collections: This comprises an octavo series of papers on the present state of knowledge on particular branches of science; it was begun in 1860 and now consists of 72 volumes. Since 1903 a quarterly issue has been published as a part of this series. It is designed in this series to publish reports on the present state of knowledge of particular branches of science, lists and synopsis of species of the organic and norganic world, museum catalogs, reports of explorations, aids to bibliographical investigations, etc., all of which are generally prepared at the specific request of and at the expense of the Institution. Several of the publications thus far issued within this series pertain to entomology, notably No. 507, "The Classifications of the Coleoptera of North America," by LeConte and Horn, and No. 1444, "A Catalogue of North American Diptera," by J. M. Aldrich. The allocation of the work to one or the other of the above two series occasionally depends upon whether the required illustrations can be presented more conveniently in the quarto or octavo form. In both of these series each article is separately paged and indexed and the actual date of its publication is that given on its special title page and not on that of the volume in which it may be placed; thus in a number of cases separates have been published and generally distributed, years before their combination into volumes.

3. Annual Reports of the Board of Regents: This series also is octavo in form and consists of the reports and proceedings of the officers of the Institution, together with a general appendix

containing a selection of memoirs of interest to collaborators and correspondents of the Institution, teachers and others engaged in the promotion of knowledge. These reports began in 1846 and have been published annually since that time, the latest number being that for 1919. This series contains occasional articles pertaining to some phase of entomology.

Entomological articles also are contained in three volumes, (v, 7, 9, and 12, pt. 1), of the *Memoirs of the National Academy of Science* issued through the Smithsonian Institution.

The Smithsonian Institution maintains for the distribution of these publications, mailing lists to public libraries and other educational institutions but it maintains no general mailing list of individuals. It issues, at regular intervals, a classified list of its publications available for distribution on that date, and this list is sent to any one on application to the Institution. Detailed instructions relative to making application for the publications may be found in the introduction to that list. In view of the fact that a number of publications occasionally are distributed gratis, it is necessary for the applicant to state reasons for his request and to indicate the necessity for securing the publication. It is intended to supply these publications only as an aid to researches or studies in which the applicant is especially interested.

A work entitled "Catalogue of Publications of the Smithsonian Institution 1846 to 1882" by Wm. J. Rhees was issued in 1882 as Smithsonian Miscellaneous Collections No. 478. This was a volume of 328 octavo pages and contained an excellent alphabetical index to all the series down to that date. The "Annual Report of the Smithsonian Institution" for 1886 contains a catalogue and index of the Smithsonian publications from 1846 to 1886 inclusive. It is regretted exceedingly that no later catalogues of this character have been published.

United States National Museum:

The publications of the United States National Museum, which is under the administration of the Smithsonian Institution, consist of the following series:

- 1.—Annual Report of the United States National Museum. This constitutes the second volume of the Annual Report of the Smithsonian Institution, the first one thus issued being for the year 1884. The special papers in these volumes, where available, are furnished free as separates to those interested. Subsequent to 1904 this series has contained only administrative reports. A certain number of these volumes are assigned to the Museum for distribution to libraries and to correspondents, and to contributors to the collections. A certain portion of the edition also is distributed by Members of Congress.

2.—The Proceedings of the United States National Museum began in 1878 and now consist of 58 bound volumes and the series contain 2,353 separates, numbered consecutively. The papers contained in this series are technical and describe or are based wholly or in part upon material in the museum. Separates of these papers can be obtained without charge by specialists and others engaged in scientific work. The completed volumes are sent only to libraries. The separates often appear many months in advance of the bound volumes, and at the date of publication of this article all the separates for volume 59 and separates for volume 60 have been issued. Beginning with volume 60 the articles in each volume are numbered consecutively and each article is paged separately. The following, comprising 349 numbers issued to January 1, 1922, within this series, pertain to entomology and to nearly related subjects:

Hymenoptera (123 numbers). 532, 760, 779, 881, 905, 1025, 1092, 1102, 1142, 1157, 1202, 1206, 1387, 1413, 1416, 1424, 1438, 1448, 1487, 1674, 1717, 1722, 1730, 1733, 1739, 1745, 1754, 1774, 1777, 1786, 1789, 1794, 1804, 1806, 1812, 1818, 1830, 1832, 1837, 1852, 1855, 1859, 1866, 1869, 1880, 1888, 1897, 1902, 1920, 1925, 1927, 1930, 1932, 1942, 1960, 1964, 1968, 1974, 1977, 1979, 1981, 1984, 1986, 1991, 2010, 2029, 2031, 2035, 2045, 2048, 2052, 2061, 2064, 2068, 2081, 2083, 2085, 2087, 2095, 2105, 2136, 2140, 2148, 2161, 2173, 2178, 2195, 2197, 2202, 2204, 2206, 2208, 2213, 2216, 2219, 2249, 2252, 2261, 2264, 2266, 2279, 2281, 2284, 2293, 2296, 2299, 2309, 2312, 2315, 2317, 2320, 2326, 2332, 2334, 2340, 2349, 2361, 2364, 2366, 2368, 2374, 2378, 2396, 2399. *Lepidoptera* (66 numbers). 581, 647, 706, 781, 838, 839, 851, 890, 891, 892, 1062, 1063, 1064, 1065, 1098, 1140, 1184, 1203, 1208, 1209, 1262, 1268, 1283, 1290, 1304, 1375, 1376, 1398, 1412, 1419, 1420, 1421, 1423, 1434, 1444, 1456, 1463, 1465, 1488, 1506, 1550, 1567, 1597, 1601, 1644, 1645, 1649, 1742, 1753, 1765, 1815, 1885, 1947, 1951, 1987, 2039, 2043, 2046, 2050, 2054, 2056, 2132, 2139, 2239, 2305, 2307, 2372. *Diptera* (42 numbers). 331, 348, 532, 1073, 1146, 1198, 1225, 1227, 1243, 1280, 1516, 1632, 1719, 1934, 1935, 1938, 1945, 1953, 1958, 1962, 1966, 1972, 2004, 2015, 2018, 2024, 2033, 2070, 2072, 2080, 2097, 2099, 2101, 2103, 2115, 2128, 2141, 2152, (2204), 2227, 2301, 2330, 2344, 2405, 2406. *Orthoptera* (29 numbers). 764, 1124, 1215, 1333, 1335, 1363, 1364, 1378, 1403, 1432, 1439, 1450, 1453, 1459, 1461, 1530, 1563, 1599, 1650, 1661, 1760, 1910, 1949, 1956, 2001, 2058, 2093, 2130, 2176. *Coleoptera* (25 numbers). 747, 1040, 1041, 1085, 1094, 1096, 1113, (1119), 1130, 1143, 1275, 1604, 1708, 1889, 1982*, 1988, 2066, 2159, 2171, 2189*, 2271, 2323, 2353, 2365, 2370, 2387. *Miscellaneous Insects* (16 numbers). 12, 440, 771, 951, 1119, 1441, 1687, 1955*, 2000*, 2119*, 2146*, 2181*, 2210*, 2237*, 2313*, 2358*. *Hemiptera* (13 numbers). 924, 1026, 1108, 1122, 1138, 1360, 1362, 2041, 2150, 2156, 2269, 2289, 2380*. *Odonata* (15 numbers). 1046, 1047, 1331, 1371, 1389, 1571, 1692, 1710, 1928, 2017, 2089, 2107, 2192, 2199, 2390. *Thysanoptera* (3 numbers) 1310, 1590, 2008. *Collemb-*

*Relate to fossil insects. Numbers in parentheses are duplicated.

bola (2 numbers). 2134, 2222. *Siphonaptera* (2 numbers). 1361, 1417. *Strepsiptera* (2 numbers). 1834, 2242. *Thysanura* (1 number). 2037. *Mallophaga* (1 number). 2201. *Araneida* (6 numbers). 782, 950, 1223, 1253, 1284, 2143. *Acarina* (5 numbers). 1382, 1553, 2167, 2303, 2394. *Myriapoda* (2 numbers). 714, 2402.

3.—The series entitled "Bulletins of the United States National Museum" was first issued in 1875. The latest number of the series is No. 117. The bulletins are intended primarily for libraries, but when available are given also to specialists working on the groups to which they relate. The following numbers of this series thus far issued pertain to entomology or related subjects: General Entomology, Nos. 19; 39, parts F, L, & O; 67. Diptera, Nos. 31; 116. Lepidoptera, 15, 35, 38; 44; 48; 52. Hymenoptera, Nos. 45; 83. Coleoptera, No. 63. Strepsiptera, No. 66. Araneida, No. 72. Hemiptera, No. 85. Isoptera, No. 108.

4.—The series entitled Special Bulletins of the U. S. National Museum has been issued in quarto size at irregular intervals and this form and series has been used only where a size larger than octavo was deemed especially desirable for presentation of the subject matter or illustrations.

5.—The series known as Circulars of the U. S. National Museum was issued primarily to bring to immediate notice the urgent wants of the Museum or to publish special information with the least possible delay. The first numbers of this series were issued in 1881 and the series now contains 51 numbers.

6.—Contributions from the United States National Herbarium. These papers already mentioned in discussion of the publications of the Department of Agriculture, have been published subsequent to July, 1902, by the U. S. National Museum.

None of the above mentioned publications are for sale by the National Museum but are issued for free distribution to those interested so long as the supply lasts. When no longer available through the Museum, a number of the publications can be procured through the office of the Superintendent of Documents, Government Printing Office, Washington, D. C.

A detailed descriptive list of the Museum publications from 1875 to 1900 inclusive may be found in Bulletin 51 of the Museum, entitled "A List of the Publications of the United States National Museum," by R. I. Gears, issued in 1902, and Supplement No. 1 to same issued in 1906, and a booklet entitled "Publications issued by the United States National Museum from 1906 to 1912" inclusive, issued in 1914. Detailed lists for the respective years of all National Museum publications issued since 1912 may be found in each of the "Annual Reports of the U. S. National Museum" issued since that date.

United States Department of the Interior:**REPORTS OF SCIENTIFIC EXPEDITIONS:**

A number of exploring expeditions have been undertaken at various times by the U. S. Government and several of these were accompanied by scientists who made large collections and voluminous notes, the results of which were later published. Details regarding the publication of these surveys may be found in a 90-page pamphlet entitled "Reports of the explorations printed in the documents of the United States Government; a contribution toward a bibliography," by A. R. Hasse, published in 1899 by the Superintendent of Documents. Probably the four great surveys conducted between 1867 and 1879, prior to the organization of the United States Geological Survey, are of the most importance to the entomologist, and are the publications which are most readily to be obtained or to be consulted. These are, (1) U. S. Geological and Geographic Survey of the Territories by F. V. Hayden, a series which comprises annual reports, final reports or monographs, bulletins, miscellaneous publications, unclassified publications and maps; (2) U. S. Geological Exploration of the 40th Parallel by Clarence King, a series which comprises annual reports, final reports or monographs, an atlas and a special publication; (3) The United States Geographic and Geological Survey of the Rocky Mountains by J. W. Powell, a series which comprises early reports, final reports and contributions to North American Ethnology; (4) The United States Geographical Surveys west of the 100th Meridian by George M. Wheeler, a series which comprises annual reports, final reports or monographs, unclassified publications, and an extensive series of atlas sheets, and topographic, geologic and land classification maps.

Practically complete files of most of the reports of these great explorations may be consulted at all of the principal libraries, and a number of scattered volumes may still be obtained by purchase from the Superintendent of Documents, or through natural history book dealers. A very full and complete catalogue and index of the publications of the Hayden, King, Powell and Wheeler Surveys has been prepared by L. F. Schmeckebier and has been issued as U. S. Geological Survey Bulletin 222. The index to this publication contains all the references of importance in the series pertaining to entomology. The series as a whole contains something over a hundred papers bearing on entomological subjects, some of which, notably on Lepidoptera and Coleoptera, are still of very high scientific value. Notable examples of the valuable character of these publications may be indicated in three monographs of the Hayden Survey, Volume 5, entitled, "Synopsis of the Acridiidae of North America," by Cyrus Thomas; Volume 10, "Monograph of the

Geometrid Moths, or Phalaenidae of the United States," by A. S. Packard; and Volume 13, the "Tertiary Insects of North America," by Samuel H. Scudder.

GEOLOGICAL SURVEY:

The publications of the U. S. Geological Survey comprise (1) Annual Reports, of which 41 annual volumes in 84 parts have been issued; (2) Monographs, of which 54 numbers have been issued; (3) Professional Papers, of which 128 numbers have been issued; (4) Bulletins, of which 720 numbers have been issued, (5) Water-supply Papers, of which 492 numbers have been issued; (6) Mineral Resources of the United States, issued annually since 1882, both in the form of completed volumes and of separates of the various chapters; (7) Folios of the Topographical Atlas of the United States of which more than 2,800 portions have been engraved and printed; (8) Folios of the Geological Atlas of the United States, of which a large number of volumes have been issued, many of which are now out of print. The series indicated under Nos. 2, 7 and 8, are sold by the Superintendent of Documents at cost of printing; all other publications of the Survey are distributed free upon application, though it is impossible to comply with general requests for all publications that are distributed free, or for requests for all publications of any series or on any subject. No person can obtain more than one copy of any one publication. In a number of instances where the Geological Survey's own stock has become exhausted, the publication, formerly free, can be obtained by purchase from the Superintendent of Documents, or from dealers in second hand scientific books. A number of the publications of the Geological Survey pertain to entomological subjects, especially to fossil insects, for example: Monograph 21 on "Tertiary Rhynchophorous Coleoptera of the United States," by S. H. Scudder; No. 40 "Coleoptera from Tertiary deposits at Florissant," etc., by S. H. Scudder; No. 47 "A Treatise on Metamorphism" by C. R. Van Hise; Bulletin 69 "A classed and annotated bibliography of fossil insects" by Scudder; No. 71 "Index to known fossil insects of the world" by S. H. Scudder, etc. There are also issued by the Survey a number of publications not to be classified as entomological but which are of general usefulness to field entomologists, such as "Guide Book of the Western United States," Parts, A, B, C and D, and the "Dictionary of Altitudes in the United States," by Henry Gannett. A well indexed Bibliography of North American Geology is issued annually by the Survey, and the file of this series may be consulted in all the principal libraries. The Survey also issues annually, for free distribution, a list of its own

publications, and this list may be obtained by any one upon application to the Survey.

United States Treasury Department:

The Bureau of Public Health Service of the Treasury Department comprises, in addition to the administrative offices, seven divisions, the operations of which are coordinated and are under the immediate supervision of the Surgeon-General. These divisions are as follows: (1) Scientific Research, (2) Foreign and Insular Quarantine and Immigration, (3) Domestic Quarantine, (4) Sanitary Reports and Statistics, (5) Marine Hospitals and Relief, (6) Personnel and Accounts, (7) Venereal Diseases. In order to coordinate to best advantage the educational work carried on by the various divisions of the Public Health Service, and especially to extend the educational services which the Bureau can render to the public at large, a section of public health education was established in 1919. This section aims to constitute itself a national center or clearing house on the subject of public health education, and it is hoped that eventually all the common avenues of publicity and education may be utilized. The scope of the work includes the preparation of press bulletins, the utilization of photographs and plates, the publication of lithographed health posters, the organization of a lecture service, the administration of a loan library of stereopticon slides and moving pictures, the preparation and organization of traveling exhibits, the maintenance of a public health information bureau, and the employment of such other educational methods as circumstances may render advisable. These various activities are in close cooperation with State and local health authorities and with other important health organizations. The Public Health Service also issues a great number and variety of health publications, consisting of the following: Public Health Bulletins, Venereal Disease Bulletins, Keep Well Series, Posters, Public Health Reports with reports and supplements, Hygienic Laboratory Bulletins, Miscellaneous Publications, Annual Reports and Yellow Fever Institute bulletins. A considerable number of these publications are of the utmost value to entomologists, especially to those who are specializing in various phases of medical entomology, notably those publications on mosquitoes and flies. The Division of Scientific Research, already mentioned, conducts the scientific investigations of the service which include intensive studies of diseases of man, including malaria, typhoid fever, and other insect-borne disorders. Much attention is given to industrial hygiene, rural sanitation, milk and water pollution and sewage. Technical and purely laboratory studies are conducted, not only at the Hygienic Laboratory in Washington, but at special field labora-

tories. Detailed information regarding the current activities and investigations of the Service may be found in the latest Annual Report of the Public Health Service for 1921, Treasury Department Document No. 2903. A complete list of all the available publications of the Service may be obtained on application to the Bureau of Public Health Service, Surgeon-General's Office, 3 B Street S. E., Washington, D. C.

United States War Department:

THE LIBRARY OF THE SURGEON-GENERAL'S OFFICE.

While the last fifty years form the most brilliant period in the history of medicine, one of the most noteworthy contributions has been the publication of the great catalogue of medical literature. This achievement largely was rendered possible by the establishment of a great national medical library. Much of the credit for this is due to the extraordinary energy and enthusiasm of that remarkable librarian, Dr. John Shaw Billings. At the close of the American Civil War, Dr. Billings, who had been an army surgeon, was assigned to duty in the Surgeon-General's Office, and it was through his influence, and his knowledge of the need for accessible medical and scientific literature, that an unexpended fund of \$80,000 was devoted to the purchase of medical books. Through his efforts the growth of the Library thus formed was rapid, and by 1871 it contained about 13,000 volumes, and by 1873 about 25,000 volumes. The necessary appropriations were obtained from Congress and the work was pushed with such skill and diligence that the Library now contains something over 254,000 volumes and 362,000 pamphlets. The collection of medical periodicals and serials is the largest in the world, and probably one of the most useful. Approximately 1,500 scientific periodicals and serials are available in the reading room of the Library for the benefit of physicians, scientists and others. The Library possesses a collection of over 300 separate items of medical incunabula, forming one of the most complete of the kind in America. It has also many rare editions of mediaeval and renaissance scientific literature, and a huge mass of smaller pamphlet writings of later times. It is, however, essentially a modern scientific library. There may be found therein copies of all the medical works appearing in the various countries, also files of medical and scientific journals and transactions of societies related to medicine such as general biology, botany, chemistry, zoology, entomology, anthropology, etc., in the various languages.

The resources of this Library are thus enumerated for the reason that all this storehouse of knowledge is rendered accessible to the entomologist through the publication by the Library

of the magnificent "Index Catalogue of the Surgeon-General's Library." The first volume of this work appeared in 1880, and subsequent to that time one volume was issued each year. The first series of 16 volumes was therefore completed in 1895. The Second Series, consisting of 21 volumes, was completed in 1916. The European War and consequent chaos caused considerable delay in the further prosecution of the work, but the Third Series was commenced in 1918, and thus far two volumes have appeared.

"What makes the Index Catalogue of the Surgeon-General's Library a monumental work," says Dr. Albert Alleman, "is the fact that it is a subject as well as an author catalogue, in which the contents of all medical periodicals have been indexed and classified under proper headings and sub-headings for the first time. The catalogue, as its name implies, is a true Index Catalogue, in which all books and journal articles appear under the various subjects and the author and subject titles form one continuous alphabet."

Detailed information respecting the history and scope of the Library and its publications may be found in an article entitled "The Library of the Surgeon-General's Office at Washington," by Albert Alleman, M. D., Principal Assistant Librarian, Surgeon-General's Office, in "Janus, Archives internationales pour l'Histoire de la Médecine et la Géographie Médicale," 1921, pp. 225-229, and in "A History of Medicine," by F. H. Garrison, Second edition, Saunders, 1917.

CONCLUSION.

It will not be found to be the part of wisdom for the student to accumulate books indiscriminately in large numbers or to acquire bulky and ill-considered files of free bulletins to remain on his shelves unstudied. It is desirable that he should acquire at the outset a collection of the more useful standard books, periodicals and bulletins on general entomology for reference, and later should allow the thoroughness and trend of his studies to determine the number and subjects of his professional book purchases. Indiscriminate acquisition merely because the publications may chance to be objects of passing interest, not only tends to divert expenditures from the more useful to the less useful, but also fosters loose habits of thinking, and may divert time and attention into miscellaneous reading which otherwise might be more efficiently employed in reading on main problems. In this as in other things the good often may be the enemy of the best. A limited number of publications well digested are of infinitely more value than an impressive and showy array of books and pamphlets, a knowledge of the contents of which the owner may be entirely innocent. The essential principle is as

true in entomology as in mechanics that "a determined soul will do more with a rusty monkey wrench than a loafer will accomplish with a machine shop."

It should be remembered, however, in this connection, that the utmost pains constantly should be taken by the entomologist to keep actively in touch with what is being published. Even though the works are not always actually obtained, the student should know something about the latest publications and most recent authorities, and when a new work comes out which is found to be really useful for his specific purpose it should be added without fail to the student's list of reference books, even though its acquisition may represent pecuniary sacrifice on his part. It is realized that where one's personal funds are limited it sometimes requires nice discrimination and business acumen to decide in such cases whether one is really "canny" or is merely "penny wise and pound foolish." A mental impoverishment and consequent failure to grasp opportunity may be a poor recompense for a few pennies saved.

Nothing is so fatal to sound habits of study as the lack of intense and hearty interest in the subject, and the substitution therefor of artificiality and dilettanteism. It is safe to say that the average entomologist of to-day in reviewing his literary efforts is profoundly struck by the vast difference between actualities and the ideals existing in the back of his mind—between that which he desires to accomplish and that which he actually accomplishes. In this connection one of the most common peas we hear is that the entomologist is so busy or so engrossed with his particular specialty, or so occupied with other things, that he has no leisure to keep up with newly issued literature or for adequate observation, reading, and thought, but this plea will vanish as soon as he really desires these things so much that he begins seriously to examine the present use of his time. If a person desires strongly enough to possess a thing at all within the range of his attainments, he will usually manage to find the time for it. Sincere desire and earnestness of purpose will be such a safeguard that he will enter thoroughly into the spirit of his work and will not permit his life to be contracted and thrown out of poise and balance by overspecialization, or to be so frittered away by inconsequential details as to lose correct perspective of relative values.

In the study of entomological literature as of most other subjects, it can not be too strongly emphasized that nothing can possibly take the place of personal enthusiasm and personal work and these must always be developed from within. "No system or discipline can supersede the necessity of being forever on the alert." "We can not get wisdom while we sleep." "Safety does not lie in stupidity alone." The training of the best school fails unless it emphasizes the importance of continual

and systematic study as the habit of a lifetime. Such habit is a growth and a development, not a creation.

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RESUME OF SERIES MENTIONED ABOVE PERTAINING TO ENTOMOLOGY.

- U. S. Department of Agriculture.
Annual Reports.
Yearbook.
 U. S. Entomological Commission.
 Reports.
 Bulletins.
 Bureau of Entomology.
 Bulletins, Old Series.
 Bulletins, New Series.
 Bulletins, Technical Series.
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Service and Regulatory Announcements.
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Reports Office of Secretary.
Circulars Office of Secretary.
- U. S. Smithsonian Institution.
 Smithsonian Contributions to Knowledge.
 Smithsonian Miscellaneous Collections.
 Annual Reports.
 National Museum.
 Annual Reports.
 Proceedings.
 Bulletins.

U. S. Department of the Interior.

Scientific Explorations.

Geographical and Geological Survey of the Territories.

Geological Exploration of the 40th Parallel.

Geological and Geographical Survey of the Rocky Mountains.

Geographical Surveys west of the 100th Meridian.

Geological Survey.

Annual Reports.

Monographs.

Professional Papers.

Bulletins.

U. S. Treasury Department.

Public Health Service.

U. S. War Department.

Library of the Surgeon-General's Office.

Index Catalogue Surgeon-General's Library.

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Phillip Dowell, Port Richmond, N. Y.

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Jno. D. Sherman, Jr., 132 Primrose Ave., Mt. Vernon, N. Y.

Geo. E. Stechert & Co., 151-155 W. 25th St., New York, N. Y.

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No. 2

MASICERA SENILIS, A PARASITE OF THE EUROPEAN CORN
BORER (PYRAUSTA NUBILALIS).

BY W. R. THOMPSON,

Specialist in Parasites, U. S. Bureau of Entomology,

AND M. C. THOMPSON.

II. *Masicera senilis* Meig.

The parasite of the Corn Borer described in this paper belongs like *Zenillia roseanae*, to the Dipterous family Tachinidae and has, like the latter species, two generations a year, in both of which the larval phase is passed in the caterpillar of *Pyrausta nubilalis*. In Southwestern France *P. senilis* does not at present appear to be a very important factor in the natural control of the Borer; but in Southern Italy, it is responsible for almost the total parasitism observed in the hibernating larvae, after the emergence of the Ichneumonid, *Eulimneria crassifemur*, another important parasite of the pest.

Systematic History.

The systematic history of *Masicera senilis* Mg. as given in the Katalog der Palaarktischen Dipteren, by Bezzi and Stein (Vol. III, 1907, p. 287) is as follows:

Ceromasia Rondani 1856

Dipt. Ital. Prodr. I. 71 (nota) et IV, 16, 1861

A. Thelyconychia B. B. 1889.

B. Lophromyia B. B. 1889.

C. Ceromasia s. str.

D. Paraphorocera B. B. 1889.

E. Leptotachina B. B. 1891.

senilis Mg. S. B. VII, 241.8. (*Masicera*) (?); Rond. Dipt. Ital. Prodr. IV, 25, 10 (1861) et Atti Soc. Ital. Sci. Nat., IV, 43, 13 (1861); R. D. Posth., I 836, 1. (*Andrina*) (1863); B. B. Denkschr. Akad. Wien, LVIII, 330 (1891); Girschn. Entom. Nachricht., XXV, 185, (1899); Hend., Verh. Zool. Bot. Ges. Wien., LI, 210, 12, (1901). *syn.—agrestis* R. D. Myod., 113, 2 (*Lydella*) (1830) et Posth., I, 857.4 (*Lydella*) (1863); Pand. R. E., XV, 52, 5 (*Tachina*) (1896); Villeneuve, B. S. E. Fr., 1900, 402 (1900).

Idoris Mg. S. B. IV, 312, 125 (1824) et VII, 190 (1838); Macq. S. a B. II, 115,

39, (Stenometopia) 1835 et Ann. de Fr. (3) II, 399, i, t. XIV, f. 1; (Oodigaster) (1846), B. B. Denkschr. Akad. Wien, LVIII, 330 (1891).
laticincta Perris. Soc. Linn. Lyon, 1852, 58, (Masicera) (1852).
?myoidea R. D. Myod., 114, 7, (Lydella) (1830) et Posth., I, 856, 2 (Lydella) (1863); Macq. Ann. S. E. Fr., (2). VIII, 468, 22. t. XIV, f. 1. (Masicera) (1850); Meade, E. M. M., (2), III, 128 (Masicera) (1893); Coquillett, Rev. Tach. N. Amer., 114. (Masicera) (1897).
nitida Mcq. Ann. de Fr., (2), VIII, 464, 14, t. XIV. f. 11 (Masicera) (1850); Brauer, Sitzber. Akad. Wien. CVI, 339, 19 (1897).
noxa Perris, Soc. Linn. Lyon, (1852) 58, (Masicera) (1852).
tincta B. B., Denkschr. Akad. Wien. LVI, 165, t. II, f. 29 (1889) et LVII. 441 (1891).

As has been stated in a preceding paper, there exist at least three varieties or sub-species of *senilis*, which can be separated fairly easily in the first larval stage, though the differences between the adults are comparatively slight. Of these varieties, one, according to Dr. J. Villeneuve, is the form described by Brauer and von Bergenstamm under the name of *Leptotachina gratiosa*, considered by Dr. Villeneuve to be merely a dark variety of *senilis*; but as two of the varieties (of which one is the parasite of *P. nubilalis*) were determined by Dr. Villeneuve as *gratiosa* B. B., it is not at present possible to identify this variety with certainty.

The species referred to by Coquillett in the Review of North American Tachinidae, under the name of *Masicera myoidea* R. D., is indigenous to North America, where it is a common parasite of Lepidopterous stem-borers. This Tachinid has been described by Townsend (Can. Ent., Jan. 1916), under the name of *Andrina radialis*. Dr. J. M. Aldrich and Mr. C. T. Greene have made a careful study of both the puparia and adults of the American species, but have been unable to discover any constant characters whereby it can be distinguished from the European species here described. Furthermore, the American Tachinid has already been reared in Massachusetts from *Pyrausta nubilalis*, though as yet it is of practically no importance as a controlling factor of the Borer in the United States. It therefore seems probable that *myoidea*- or *radialis*-is taxonomically identical with *senilis*, although biologically the two forms may perhaps be distinct. It is hoped that further researches will clear up this question.

The characters of the genus *Ceromasia*, to which *senilis* is referred by Bezzi and Stein, are given in the analytical tables of Brauer and von Bergenstamm somewhat as follows:

Front not inflated, eyes bare: mouth parts well developed; vibrissae on a level with the oral margin: parafacials bare: facialis feebly ciliate on less than the lower half: ocellar bristles well developed: male without orbital bristles, female with two: third segment of antenna more than twice as long as second: its apex

rounded or rounded-truncate: second segment of arista slightly elongate: apical cell ending far before wing tip: no appendage at bend of fourth vein: veins without setae except two or three at base of third longitudinal vein: apical bristles present on scutellum; abdominal macrochaetae discal and marginal; hind tibiae irregularly ciliate: male claws not perceptibly more elongate than those of female.

Description of *Ceromasia senilis* Meig., var. from *Pyrausta nubilalis*.

Adult—(Figure 1.)

Average measurements, 7.0-9.0 mm. x 2.0-3.0 mm.

Male.—black, the calypteres cream-colored, the wings hyaline. Front about as wide as eye, seen from above: frontal vitta dark brown: one pair of ocellar bristles, anteriorly directed: pollen of parafrontals, parafacials and cheeks, bluish-grey: a single row of strong frontal bristles and outside this a few rows of fine hairs: 3-4 frontal bristles below the base of antenna, the row extending to a point a little below the level of the arista: parafacials bare: facial ridges ciliate on about the lowest fourth; cheeks about one-fifth eye height: eyes bare: palpi black, in some specimens tinged with brown: occiput flat: antennae as long as facial plate: the third segment about four times as long as the second: the arista thickened on the basal $\frac{2}{3}$ - $\frac{3}{4}$.

Mesonotum black, thinly dusted with greyish-blue pollen: a pair of narrow median and a pair of broad lateral black vittae, distinct on the anterior side of the suture but posteriorly indistinct, evanescent: or the median pair sometimes fused: pleurae black, dusted with greyish pollen: 4 post-sutural bristles, 3 post-acrostichals, 4 sterno-pleurals, 1:2:1: scutellum rather thinly pollinose, bearing three pairs of marginal bristles, a pair of cruciate dorso-anteriorly directed apical bristles and a pair of discal bristles: abdomen with segments II-IV bluish-grey pollinose anteriorly, the bands of pollen interrupted by a narrow median black vitta; 1st segment with a pair of marginal bristles, 2d with a pair of discals and a pair of marginals, 3d with a pair of discals and a ring of marginals, 4th with numerous scattered bristles: hypopygium black: the ventral surface of segment III bears on each side, near its ventral margin, a rounded area whose diameter almost equals the length of the segment at that point, covered with very small fine numerous spines, thus differing markedly from the corresponding areas on the remaining segments and from the remainder of the surface of the 3d segment: legs black, very thinly pollinose: hind tibiae irregularly ciliate.

Female with a pair of anteriorly directed orbital bristles, the inner row of the outer frontals sometimes well developed: front slightly wider than eye as seen from above: antennae not extending quite to the level of the vibrissae: 3d antennal segment from $2\frac{1}{2}$ -3 times as long as the second, palpi often brownish anteriorly.

One female among the few specimens we possess, reared from the Corn-Borer and certainly con-specific with the others, has the arista thickened on the basal half only.

The figure of the male hypopygium (Fig. 2) as seen from the side, may be compared with that of *Zenillia roseanae*, given in a previous paper.

Larva:

Stage I.—Length 0.95 mm., width 0.25 mm. (Fig. 3).

Elongate, rather slender, tapering anteriorly, posteriorly rounded; skin colorless and transparent: head without spines: an anterior band of spines on segment I, broadest pleurally and ventrally: also a narrow dorsal band of two rows situated about midway between the anterior band and the anterior edge of segment II: this band runs into the pleural part of the anterior band at its ventral extremity: between this band and the posterior border of the anterior band there is a glabrous area: on the anterior margin of segment II, a band of spines composed of 7 rows: between this band and the anterior border of segment III an intermediate band resembling that on segment I: in this segment, however, the band does not fuse with the anterior band but ends in the pleural region: ventrad of its extremity and in a line with it are two small pleural groups of spines as well as a short ventral row of 6 or 7 spines: on segment III the anterior spine band is composed of 4-6 rows: the intermediate band also exists and resembles that on segment II: on all the abdominal segments the intermediate band is absent; the anterior band is composed on segments IV and V of 2-4 rows: on segment VI there are 2-3 dorsal rows and 3-4 ventral rows: on segment VII-X, similar anterior bands exist but as one proceeds posteriorly, the dimensions of the individual spines become smaller, especially dorsally: in all the rows described the spines are directed posteriorly: on segment IV, in the pleural region, near the posterior border there appears a short row of 2-4 spines anteriorly directed: on segment 5 this group is composed of 2 and in some places of 3 rows comprising each 7-8 spines: on segment VI, the two pleural groups, now slightly larger, are joined by a single ventral row: in segments VII-IX these posterior bands are complete both ventrally and dorsally: on the anterior segments they are very feebly chitinized and though on segment X they are as strong as the spines on the anterior border, they are never as well developed as the anterior spine bands on the anterior segments: finally, segment XI presents on the anterior border a band of two or three rows of poorly developed spines, especially feeble in the dorsal region and ventrally, surrounding the anal aperture, in a ring which is broken just behind the posterior stigmata, 2 closely approximated bands, broadest ventrally, of which the anterior has the spines anteriorly directed, the posterior, directed backward.

The larva is metapneustic, the posterior spiracles of the usual form the "felt-chambers" slender, (Fig. 4) about 12 times as long as wide: the stigmatic spines described in the larva of *Zenillia roseanae* do not exist in this species. (Fig. 5.)

The sensorial organs do not differ in form from those of *Zenillia roseanae*: the antennal organ is small and depressed, about $\frac{1}{2}$ as wide as the diameter of its base. (Fig. 7a.)

The form of the bucco-pharyngeal armature of the first stage larva is shown in Figure 6, prepared from the armature of a larva at the end of the first stage: in this species there is no such change in the form of the basal plates as was described in the larva of *Z. roseanae*; the only perceptible modification in the form of the organ being an expansion of the pedicel or stem of the dorsal wing of the basal plate, which is in the newly hatched larva only about half as broad as in the armature figured: no articulations exist in the bucco-pharyngeal arma-

ture: the median tooth, which is well developed and rather strongly curved, presents on its anterior or cutting edge, 7 or 8 teeth disposed as shown in the figures. (Fig. 7.)

Stage II.—Length 3.0 mm., width 1.0 mm. (Fig. 8).

Skin colorless and transparent, cuticular spines, though larger than in preceding stage, usually minute in comparison with the size of the larva and hence very inconspicuous: as in the preceding stage, there exist bands of spines on the anterior borders of the segments, directed backward, which are most strongly developed on the anterior segments and become less and less conspicuous toward the posterior end of the body: on the posterior borders of the segments, there exist similar bands of spines, directed forward, these bands being poorly developed in the anterior region but more and more conspicuous as one proceeds toward the posterior extremity of the larva; as we have seen, in the first stage the posterior bands of spines appear first on segment IV, but in stage II, a dorsal and ventropleural band of feeble spines exists on the posterior border of segment I: finally, as one proceeds posteriorly, the individual spines in the anterior bands become smaller and less strongly chitinized while the spines of the posterior bands become larger and more strongly pigmented: on the last segment of the body there exist two curved bands of spines in front of the stigmatic area, the anterior band broken ventrally, the posterior, ventrally entire, and arising in the pleural region, composed of 4-6 rows of minute spines directed forward while the spines of the anterior band are directed backward.

In this stage the larva is amphipneustic: each anterior stigma presents from 6 to 9 respiratory papillae (Fig. 9): the "felt-chambers" are about 4 times as long as their width. The felt-chambers of the posterior spiracles are about 2 times as long as their diameter: (Fig. 10).

The bucco-pharyngeal armature now terminates anteriorly in a pair of lateral hooks: it presents an articulation between the base of the intermediate region and the anterior border of the basal plate: in this stage the armature is somewhat irregular in form, the anterior hooks are rather ill-defined and only slightly curved, the organ as a whole is very short and stout, the dorsal and ventral wings of the basal plate are of almost equal width. (Fig. 11.)

Stage III.—Length 13.0 mm., width 3.5 mm. (Fig. 12).

Skin colorless and transparent: a group of stout spines on either side of the mouth: on segment I, only a very short ventral band of spines immediately posterior to the buccal opening: on segments II-VI, an uninterrupted anterior band: on segments VII and VIII the anterior band interrupted in the pleural region: on segment IX the dorsal part of the band is reduced to a single row of feeble spines: on segment X there is only a short pleural row and a ventral band: on the last segment the anterior band is absent: on segment III there appears on the posterior border a row of anteriorly directed spines in the ventral region: on segment IV, this posterior band completely surrounds the body, being strongest in the ventral and pleural regions, where it is composed of several rows: on segments V-IX, a similar band exists, and on these segments it is composed of several rows: on segment XI there is a broad band of spines surrounding the posterior stigmata and covering the greater part of the surface of the segment, with the exception of an anterior area broadest

in the ventral region and narrowest in the pleural region: the anal opening is situated close to the anterior border of segment XI, on the ventral side:

In this stage the larva is amphipneustic: the anterior spiracles (Figs. 13, 14) present from 6-9 respiratory papillae arranged as shown in the figure: the cylindrical part of the "felt-chamber" is about $2\frac{1}{2}$ times as long as its diameter: the respiratory area of each of the posterior stigmata (Fig. 15) is surrounded by an unbroken peritreme: the moulting scar is situated near the middle of the stigmatic area: each stigma presents three curved respiratory slits, situated one dorsad, the other two ventrad of the moulting scar: in the specimen represented, the dorsal slits are subdivided but they are often entire: the felt chambers of the posterior spiracles are about three-fourths as long as their diameter.

The form of the bucco-pharyngeal armature (Fig. 16) differs greatly from that observed in the preceding stage: the anterior paired hooks are long and slender, curved and acute at the tips: an articulation exists between the base of the intermediate region and the basal plate the inner surface of the labium (Fig. 17) presents a brown chitinated area, semicircular in form, bearing a number of irregular teeth directed forward: the hypopharyngeal plate is divided into two halves, each somewhat rhomboidal in outline and bearing an oval sensorial area; the epipharyngeal plate (Fig. 18) is irregularly rounded in form and bears several sensorial areas as shown in the figure.

The puparium, which measures about 7.7 mm. x 2.5 mm. varies in color according to age from light to dark chestnut brown: the surface is smooth and moderately shining: the posterior stigmata are situated on the dorsal side of the posterior pole of the puparium, about $1\frac{1}{2}$ times the dorso-ventral diameter of the stigmata from the pole, which is rounded, not pointed, as in *Z. roseanae*: the stigmata are not elevated, the distance between them is equal to about 4 times the diameter of one of them: the anterior stigmata are not prominent: the prothoracic cornicles of the pupal respiratory apparatus (Fig. 19) are stout, about 3 times as long as wide and heavily chitinated: the openings in the distal extremity of the cornicle are arranged as shown in the figure (Fig. 20): the internal spiracle is circular in form and presents about 8 double rows of papillae radiating from the centre of the spiracular disc.

Biology.

The oviposition of this species has not yet been observed: but the structure of the reproductive system of the adult female and that of the primary larva indicates that the larvae are deposited directly on the body of the caterpillar of the Corn Borer at the time when the latter is feeding externally on the corn plant.

Immediately or at all events very shortly after its entrance into the body of the host, the first stage larva forces the posterior extremity of its body, bearing the posterior stigmata, through the wall of the tracheal trunk in the vicinity of the spiracle and in this situation it remains until the third stage (Fig. 21): as a result of the injury thus induced in the tracheal epithelium, there forms around the body of the parasite larva a sheath of

which the basal portion is chitinized and dark brown in color, while the remainder is white, semi-transparent and unchitinized, the two regions being sharply separated: the tracheal sheath extends generally almost to the anterior extremity of the larva and in some cases appears to surround it completely: while it is within the tracheal sheath the larva apparently feeds only upon the blood of the host but after it has emerged into the body cavity it begins to devour indiscriminately all of the internal organs so that when it issues from the caterpillar it leaves only the empty skin: the emergence from the tracheal sheath and the change in the feeding habits of the parasite occur after the II-III stage moult.

After it has finished feeding, the larva usually emerges from the caterpillar and pupates in the gallery beside the remains of the host: but on a few occasions, puparia of the species have been found within the skin of the caterpillar of the Borer: finally, although the larvae of this species usually pupate within the galleries of the host they can do so equally well under artificial conditions in almost any receptacle.

Seasonal history.

As but few specimens of this species have as yet been reared in the laboratory at Auch, our information as to the details of its seasonal history are as yet only fragmentary.

Like *Z. roseanae*, it has in Southwestern France, two generations a year and is in both generations a parasite of *Pyrausta nubilalis*; the period of hibernation is passed in the second larval stage in the hibernating caterpillars of the host; the first puparium obtained in 1919 was found in a corn stalk out of doors on April 9 and from this the adult emerged on May 3, but the bulk of the emergence of the parasite larvae from the caterpillars probably takes place after the date on which the puparium in question was found, as on that date, even in caterpillars which had been for some time subjected to indoor conditions, second stage larvae of *P. senilis* were present. In caterpillars of the summer generation, in 1920, a small third stage larva of *senilis* was found on July 27; on July 30 a puparium was collected in the field; and on August 14 another was found, but we have no data as to the length of the pupal stage in this generation.

In dissections of summer caterpillars at Menton (Alpes Maritimes), on July 29, 1920, living larvae of *senilis* in all stages were found.

In stalks containing hibernating larvae examined at Auch during the winter of 1920-21, a puparium of *senilis*, from which the fly emerged on January 17 was found on December 28, but as no other puparia were found during the winter in many thousands of stems examined, this may be regarded as an abnormality in the seasonal history,

In material received from Southern Italy (environs of Naples), the development of *P. senilis* was observed to follow a course somewhat different from that which it takes in Southwestern France; dead caterpillars containing full-fed larvae of *senilis* and fresh puparia of this species were found in boxes of this material received from Prof. Silvestri as early as January 25, and we have continued to find them up to the date of writing (March 10). On January 28, two male flies emerged from a lot of these puparia and adults have since continued to issue from time to time up to the present date.

The puparia obtained from the Italian hibernating larvae were found by parasites which had all emerged from *nubilalis* larvae in stage V, and these puparia are as a rule considerably smaller than those obtained from both hibernating and summer caterpillars in Southern France.

Geographical Distribution.

Paraphorocera senilis has been found in the larvae of *Pyrausta nubilalis* collected in several of the Departments of Southwestern France (Gers, Landes, Hautes Pyrenees), on the French Riviera at Hyeres (Var) and at Menton (Alpes Maritimes), and in the neighborhood of Naples in Southern Italy. It has not been found in material received from corn stalks in Southern Germany (Wurttemberg) nor in caterpillars infesting *Artemesia* collected around Brussels in Belgium, although a Tachinid heretofore considered by specialists to belong to the same species—though differing from the Borer parasite by certain characters both in the larval and in the adult stages—is known to occur in the North.

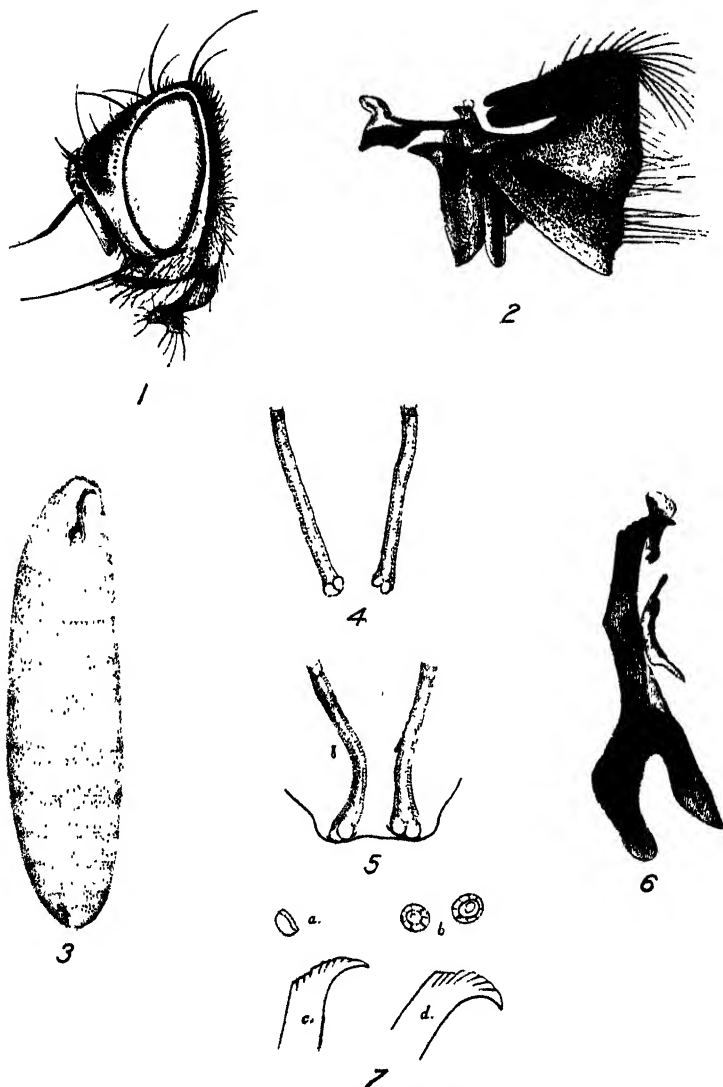
Importance as a Controlling Factor of the Corn Borer.

In Southwestern France, *Paraphorocera senilis* would appear to be at present of little importance as a parasite of the Corn Borer. The average parasitism by this species observed in hibernating larvae in the winter of 1919-1920 amounted to only about 1.35%, and in the summer generation of 1920 to only 0.9%. *P. senilis* is thus at present less important in the region in question than *Zenillia roseanae*. Along the French Riviera, however, the writer found that while both species are present, *P. senilis* seemed to be the more abundant, while in a considerable amount of material received from Naples, *roseanae* has been found on only one occasion, the dominating parasite being *senilis*, which, in 1920-21 was found in about 20.8% of the caterpillars dissected. It would thus appear that this species is an important factor in the natural control of the Corn Borer only in the warmer regions of Southern Europe where it replaces

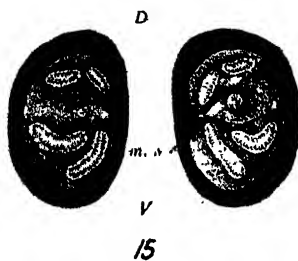
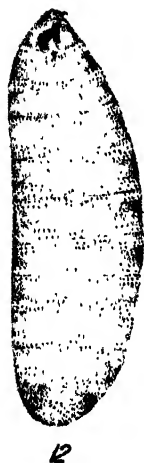
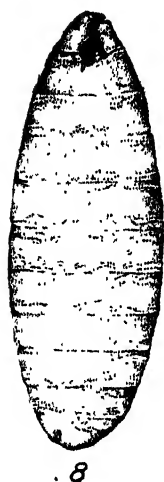
Zenillia roseanae, but further researches will be necessary in order to determine the real significance of the data obtained.

EXPLANATION OF PLATES.

- Fig. 1. *Ceromasia senilis* Mg. Head of male, lateral view.
Fig. 2. *Ceromasia senilis*. Male hypopygium, lateral view.
Fig. 3. *Ceromasia senilis*. Larva, stage I.
Fig. 4. *Ceromasia senilis*. "Felt-chambers" and posterior spiracles of larva 1st stage larva.
Fig. 5. *Ceromasia senilis*. Dorsal view of posterior extremity of 1st stage larva, showing absence of stigmatic spines.
Fig. 6. *Ceromasia senilis*. Bucco-pharyngeal armature, 1st stage larva.
Fig. 7. *Ceromasia senilis*. a. antennal organ lateral view: b, the pair of antennal organs from above: c, d, anterior extremities of bucco-pharyngeal armature: stage I.
Fig. 8. *Ceromasia senilis*. Larva, stage II.
Fig. 9. *Ceromasia senilis*. Anterior spiracle and its "felt-chamber," stage II.
Fig. 10. *Ceromasia senilis*. "Felt-chamber" of posterior spiracle, stage II.
Fig. 11. *Ceromasia senilis*. Bucco-pharyngeal armature of 2d stage larva.
Fig. 12. *Ceromasia senilis*. Larva, stage III.
Fig. 13. *Ceromasia senilis*. Anterior spiracle with six respiratory papillae, as it appears in the larva, stage III.
Fig. 14. *Ceromasia senilis*. Anterior spiracle with 9 respiratory papillae as it appears in the puparium.
Fig. 15. *Ceromasia senilis*. Posterior spiracles, stage III. D, V, dorsal and ventral directions: m. s. moultscar indicating the point on the surface of the stigmatic area through which the trachea of the preceding stage issued at the moment of the moult.
Fig. 16. *Ceromasia senilis*. Bucco-pharyngeal armature 3d stage larva.
Fig. 17. *Ceromasia senilis*. Inner surface of labium and hypopharyngeal plate, 3d stage larva. b, base of lateral hook: c, chitinized area on inner surface of labium: h, hypopharynx with its sensorial areas: s, spines at the sides of the mouth opening.
Fig. 18. *Ceromasia senilis*. Epipharyngeal plate, stage III.
Fig. 19. *Ceromasia senilis*. Pupal respiratory apparatus, 3d stage larva. c. p., prothoracic cornicle: i. s., internal spiracle.
Fig. 20. *Ceromasia senilis*. Tip of prothoracic cornicle of pupal respiratory apparatus.
Fig. 21. *Ceromasia senilis*. Hibernating larva in stage II, in situ in its tracheal sheath. l. larva: u. p. s., unchitinized part of sheath: c. p. s., chitinized part of sheath: t. t., tracheal trunk.



THOMPSON—MASICERA SENILIS



THOMPSON—MASICERA SENILIS



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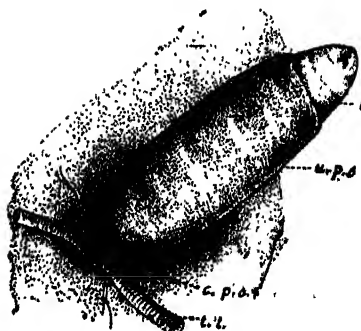
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THOMPSON—MASICERA SENILIS

SOME NEW GENERA AND SPECIES OF LONCHAEIDAE AND SAPROMYZIDAE (DIPTERA).

By J. R. MALLOCH.

The types of the species described in this paper are deposited in the United States National Museum unless stated otherwise in the text.

Lonchaeidae.***Lonchaea arkansensis*, sp. n.**

Male.—Blackish blue, glossy, abdomen with a bronzy tinge. Frons shining blue, lunule, face and cheeks silvery; antennae and palpi fuscous. Legs black, basal 2 or 3 segments of tarsi rufous yellow. Wings clear, veins yellowish. Calyptrae and fringes white. Halteres black.

Eyes bare; some setulae above orbital bristle, frons with rather strong hairs; antennae short, separated by length of second segment, third not twice as long as wide, not reaching mouth; arista subnude; cheek with about 3 strong bristles anteriorly. A weaker pair of acrostichals in front of the strong prescutellar pair; some hairs at base of stigmal bristle and in center of pteropleura, no hairs on scutellum. Abdomen broad, but little tapered, apical 3 tergites subequal in length. Legs normal. Fringe of calyptrae a little longer at angle. Auxiliary and first veins very close apically; inner cross vein just beyond apex of first vein.

Female.—Similar to male, but the frons one-third of the head width, the antennae closer together, the pteropleura bare and no hairs at base of stigmal bristle. The ovipositor is remarkably broad, being almost as wide as frons, with longitudinal striae, the tip sharp, coming to a rather abrupt point, with very short terminal hairs.

Length, 4–5 mm.

Type, male,* Hot Springs, Ark., June 21 (H. S. Barber). Allotype, Las Vegas Hot Springs, N. M., June 8 (Barber and Schwarz).

The female may possibly belong to a different species but I consider them conspecific at this time.

***Lonchaea subpolita*, sp. n.**

Female.—Similar in color and general habits to *polita* Say. Differs in having the calyptrae brown with fuscous fringes, the second antennal segment is largely reddish brown, as is also the third segment below at base. Tarsi rufous yellow, apically infuscated. Wings yellowish, veins yellow basally.

Upper orbits polished; frons slightly granulose, fine haired; frontal triangle hairy; third antennal segment a little over twice as long as wide; arista subnude; cheek with fine hairs. No extra stigmal hairs; pteropleura bare; some fine hairs between apical pair of scutellar bristles. Ovipositor with 2 exceptionally long hairs at preapical constriction.

Legs as in *polita*. Distance along costa from apex of auxiliary vein to apex of first distinctly more than one-third as great as distance of former from humeral cross-vein; first posterior cell not narrowed apically; inner cross-vein

slightly before apex of auxiliary vein and middle of discal cell. Fringes of calyptrae not very long at angle.

Length, 3.75 mm.

Type, Black Mt., N. C., May, north fork of Swannanoa (Coll. N. Banks).

The preapical dorsal hairs on genitalia of females of *marylandica* and *laticornis* are extremely short as compared with those of *subpolita*.

***Lonchaea occidentalis*, sp. n.**

Male and Female.—Similar in color to *polita* Say, the calyptrae white, with white fringes, and the tarsi largely rufous yellow.

Differs from *polita* in having the frons of male much wider, at anterior margin as wide as at least half of the entire length of frons, the upper orbits largely microscopically granulose, the hairs at outer angle of calyptrae much longer than rest of fringe, and the ovipositor with 2 exceptionally long preapical dorsal hairs. In other respects as *polita*. Length, 4–4.5 mm.

Type, male, Flagstaff, Ariz., July 6 (H. S. Barber). Allotype, San Mateo Co., Calif. (Baker). One male paratype, Mt. View (?), Cal. (Ehrhorn), one female paratype, Claremont, Cal. (Baker).

A series of five specimens from diseased *Dasyllirion*, Santa Rita Mts., Arizona, collected by E. A. Schwarz and H. S. Barber, December 8, 1913, and reared by R. S. Shannon, January, 1914, belong also to this species.

Differs from *subpolita*, which has also exceptionally long preapical dorsal hairs on the ovipositor, in having the upper orbits microscopically granulose, the calyptrae white, with white fringes, the distance between auxiliary and first veins about one-sixth as great as distance from the former to humeral cross-vein.

***Lonchaea coloradensis*, sp. n.**

Male.—Similar to the preceding species and *polita* in color.

Differs from *polita* and *occidentalis* in having the third antennal segment about twice instead of at least three times as long as wide. Upper orbits granulose, very narrow, with one or two hairs above the orbital bristle; cheek narrower than third antennal segment, with a series of fine setulose hairs. Fringe of calyptrae uniform. Venation as in *polita*.

Length, 4.5 mm.

Type, Colorado; no other data.

***Lonchaea marylandica*, sp. n.**

Male and female.—Glossy, blackish blue. Frons subopaque black, the ocellar triangle and upper orbits glossy dark blue; antennae black. Legs black. Calyptrae and their fringes yellowish white. Wings clear, veins yellowish.

Eyes bare; frons of male at anterior margin about as wide as third antennal segment, of female a little less than twice that width, distance from anterior ocellus to anterior margin of frons in female over 1.5 as great as the width at anterior margin; orbital bristle proximad of anterior ocellus; orbits bare above the bristle, smooth; ocellar triangle with much shorter and fewer hairs than in *vaginalis* Fallen; cheek with some moderately long setulose hairs in a single series; third antennal segment about twice as long as wide. Thorax, abdomen, and wings as in *vaginalis* except that there are no fine hairs between the apical pair of scutellar bristles as in that species.

Length, 3.5–4 mm.

Type, male, allotype, and six paratypes collected as larvae under bark, Plummers Island, Md., April 7, 1915, emerged as imagines April 24, 1915 (Barber and Shannon).

Two female paratypes, White Mts., N. H. (Morrison).

Lonchaea atritarsis, sp. n.

Male.—Black, shining, with a bluish tinge on thorax and abdomen. Legs black. Calyptrae brown, fringes black. Wings clear, veins yellowish. Halteres black.

Eyes bare; frons with rather long dense erect hairs, one or two of which are above the anterior orbital bristle; third antennal segment about 2.5 as long as wide; frontal lunule hairy; cheeks with long but not dense setulose hairs. Some long hairs at base of stigmal bristle, the latter not differentiated from them; pteropleura bare; scutellum with hairs only on margins. Tergites of abdomen subequal. Legs slender. Second costal division very short; wing pointed. Fringes of calyptrae of moderate length.

Length, 5 mm.

Type, Kaslo, B. C. (A. N. Caudell).

Sapromyzidae.

Camptoprosopella maculipennis, sp. n.

Female.—Honey yellow, shining. Apex of third antennal segment and ocellar spot black; palpi yellow. Abdomen largely suffused with fuscous. Legs yellow. Costal margin of wing to beyond apex of third vein, except a short space beyond apex of first vein, and the cross-veins broadly brown. Calyptrae and halteres yellowish.

Third antennal segment about 2.5 as long as wide, but little tapered apically. Thorax with three pairs of dorsocentral bristles. Last section of fourth vein about 2.5 as long as preceding section.

Length, 2.5 mm.

Type, Stone Cabin Canyon, Santa Rita Mts., Arizona, August 25, 1913, on *Thurberia thespesoides* (W. D. Pierce).

Trigonometopus Macquart.

This genus contains six described species from North and South America. Of these, two are unknown to me but I have seen the types of three of the others. I present a key for the identification of the species I have seen.

Key to Species.

1. Anterior pair of dorsocentral bristles in front of suture; frons not more than 1.5 as long as wide. 2.
- Anterior pair of dorsocentral bristles behind suture; frons at least twice as long as wide. 3.
2. Wing with two small round spots on apical section of third vein, and both the cross-veins dark brown. *punctipennis* Coquillett.
- Wing immaculate; pleura largely fuscous; prescutellar acrostichals minute. *immaculipennis*, sp. n.
3. Dorsum of thorax with four blackish vittae; dorsum of abdomen almost entirely blackened; median dark vitta on wing conspicuous
angustipennis Knab.
- Dorsum of thorax with pale brownish vittae or indistinctly vittate. . . 4
4. Median vitta on wing distinct; dorsum of abdomen with a broad blackish vitta on each side. *albifrons* Knab.
- Median vitta on wing very faint; dorsum of abdomen with a narrow centrally interrupted brownish fascia on posterior margin of each segment. *vittatus* Loew.

Of the other two species unknown to me *reticulatus* Johnson may be known by the presence of blackish bars between the wing veins and *rotundicornis* Williston by the narrow brown costal margin which extends to apex of fourth vein.

It appears pertinent to state that the African species *setosus* Knab does not belong to this genus though described as belonging here. The presutural thoracic bristle is present in the type specimen which I have examined.

Trigonometopus immaculipennis, sp. n.

Female.—Head yellowish testaceous; face with a gray median vertical stripe; frons with a gray stripe on each side mesad of the orbital bristles which extend forward over the space between the bases of antennae and eyes. Thorax colored as head, the dorsum gray except along the series of dorsocentral bristles and the lateral margins; disc of scutellum and pleurae largely gray. Abdomen, legs, and halteres yellowish testaceous. Wings hyaline, veins dark brown.

Head and eyes but little higher than long; face receding; longest genal bristle below middle of eye; third antennal segment as long as high; arista pubescent; frons longer than wide, with numerous setulose hairs on sides at base of antennae; ocellar bristles minute; postvertical bristles of moderate strength. Venation as in *vittatus*.

Length, 4 mm.

Type, Cayamas, Cuba (E. A. Schwartz).

Xenochaetina, gen. n.

This genus is the only one in the family which has setulae at the base of the second wing vein.

Genotype, *Lauxania muscaria* Loew.

Key to Species.

1. Yellow species, disc of mesonotum posteriorly and the scutellum brownish;
fore legs normal; wings not infuscated at bases *pallida* sp. n.
- Black or bluish black species 2.
2. Fore tarsi much thickened, fore legs entirely deep black; face entirely pale
gray pruinose, opaque; wings hyaline *crassimana*, sp. n.
- Fore tarsi but slightly thickened basally; at least the tarsi more or less
pale; face glossy black, not pruinose 3.
3. Wings not blackened at bases *muscaria* Loew.
- Wings blackened at bases *flavipennis* Wiedmann.

Xenochaetina pallida, sp. n.

Male.—Glossy testaceous yellow. Wings yellowish hyaline.

Structurally similar to *muscaria*, but the apical section of fourth vein is distinctly longer than the preceding section whereas in *muscaria* it is almost imperceptibly longer.

Length, 4.5 mm.

Type, Chinandega, Nicaragua. Paratype, Granada, Nicaragua. C. F. Baker, collector.

Xenochaetina crassimana, sp. n.

Male.—Glossy black; face opaque gray pruinose. Dorsum of thorax faintly gray pruinose. Antennae brownish. Legs black, mid and hind tibiae, and tarsi yellowish. Wings hyaline.

Face less convex than in other species. Structure and chaetotaxy as in *muscaria*. Fore tarsi much thickened, the basal segment as thick as tibia. Penultimate section of fourth vein about three-fifths as long as ultimate section.

Length, 4.5 mm.

Type, Los Palmares, Venezuela.

Decela, gen. n.

This genus is distinguished from *Sapromyza* Fallen by having but one strong sternopleural bristle.

Genotype, *Sapromyza crevecoeuri* Coquillett.

Decela wetmorei, sp. n.

Male.—Head fulvous, frons and occiput largely fuscous above, with whitish pruinose, so greasy in type that it is not possible to decide its normal coloration. Abdomen fulvous, with more or less fuscous color on dorsum. Legs

whitish yellow, the fore pair paler, apical segment or fore tarsi deep black. Wings yellowish. Halteres yellow.

Frons less than one-third of the head width, both orbital bristles strong, ocellar and postvertical bristles short and weak; hairs on upper side of arista much longer than those on under side; third antennal segment about twice as long as wide; eyes large, very much narrowed below; face slightly convex. Thorax with two pairs of dorsocentrals; prescutellar acrostichals distinct; scutellum with four equal bristles. Fore femur with a series of black posteroventral bristles; fore tibia swollen near base; fore tarsi stout, longer than tibia; preapical tibial bristles weak. Abdomen short and broad, the hypopygium large. Last section of fourth vein about 2.5 as long as preceding section.

Length, 2.5 mm.

Type, Paradise Key, Fla., February 21, 1919 (A. Wetmore).
Named in honor of the collector.

Melanomyza, subgen. n.

Similar to the preceding genus; distinguished from it by the convex glossy face and normal fore tibiae of the males.

Genotype, *Lauxania gracilipes* Loew.

Melanomyza incongrua, sp. n.

Female.—Black, shining. Head with whitish pruinescence above and laterad of the anterior orbital bristle, on the narrow facial orbits, and along margin of eye on lower two-thirds of occiput; frons shining; face glossy; antennae honey yellow, darkened towards apex of third segment; arista brown; palpi black. Thorax with slight yellowish pruinescence on dorsum, propleura, fore coxae, and upper part of mesopleura white pruinescent. Abdomen shining black, with a slight olivaceous tinge. Legs black, tibiae and tarsi brownish yellow. Wings slightly yellowish. Calyptres brownish yellow. Knobs of halteres pale yellow.

Frons over one-third of the head width at vertex, its anterior width a little less than equal to its length; anterior orbital distinctly shorter than the posterior one; face convex, with an oblique depression on each side one-third from mouth margin; antennae extending to or slightly beyond mouth margin, third segment at least four times as long as wide; arista short haired. Thorax with two pairs of dorsocentrals; prescutellar acrostichals distinct; four series of setulae between the dorsocentrals; sternopleura with one strong bristle. Inner cross-vein at middle of discal cell.

Length, 2.5 mm.

Type, Biscayne Bay, Fla. (Mrs. A. T. Slosson).

Melanomyza intermedia, sp. n.

This and the next species are so similar to *gracilipes* Loew that they have been found all standing under that name in nearly all collections examined. The only exception to this was in the material identified by Dr. Melander, and in that it was identi-

fied as *signatifrons* Coquillett, to which species it will run in Melander's key to *Sapromyza* and allies.

Apart from the structure of the genitalia of both sexes *intermedia* may readily be separated from *gracilipes* by the markings of the frons. In *gracilipes* there is a large subquadrate velvety black spot in middle of front margin of frons and the triangle is very short, not extending to middle of frons, while in *intermedia* there are two wedge-shaped velvety black spots in front between which the triangle extends rather broadly to the anterior margin.

Length, 3-4 mm.

Type, male, Glen Echo, August 8, 1921. Allotype, Cabin John, Md., July 31, 1921 (J. R. Malloch). Paratypes, a large series of specimens from the two localities above mentioned, District of Columbia, Falls Church, Va., and Illinois. Paratypes in the collections of Museum of Comparative Zoology, and Illinois Natural History Survey.

***Melanomyza scutellata*, sp. n.**

More nearly resembles *intermedia* than *gracilipes*. Differs in the markings on frons. The orbits and triangle are not so distinctly shining as in *intermedia* and the triangle is very much attenuated anteriorly, reaching the anterior margin as a mere line while the shining part of the orbits is confined to a small round area at base of each bristle. The male and female genitalia differ from those of *intermedia* and *gracilipes*.

Length, 3-4 mm.

Type, male, and allotype, Cabin John, Md., July 31, 1921 (J. R. Malloch). Paratypes, from Glen Echo, Md., Little Falls, D. C., Conduit and Potomac Roads, Md., and several other localities near District of Columbia. Also occurs in Illinois and Kansas.

***Sapromyzosoma*, gen. n.**

This genus differs from *Sapromyza* Fallen by the nature of the armature of the costa. The latter has the small black setulae, which give to the costa a thickened appearance, continued to apex of second vein, becoming weaker from there on and discontinued before reaching apex of third vein. In *Sapromyzosoma* these black setulae are continued to apex of third vein where they cease abruptly.

Unfortunately, in the "Canadian Entomologist," 1920, page 127, I inadvertently used the generic name *Sapromyzosoma* in connection with the description of *citreifrons* Malloch. This species must therefore be considered as the genotype though the present paper is the first to contain the generic definition.

***Ensapromyza*, gen. n.**

This genus is distinguished from the foregoing, to which it is most closely related, by the presence of setulae on the third

wing vein extending for some distance from its base, and one or two hairs on pteropleura. Fourth wing-vein slightly curved forward apically.

Genotype, *Sapromyza multipunctata* Fallen (European).

***Sapromyza serrata* Malloch.**

Male.—Closely related to *quadrilineata* Loew, having the thorax quadrivittate and the dorsum of abdomen marked with 4 series of large brown spots. The legs are banded with brown but the apices of tibiae are pale.

The fifth abdominal sternite has a pair of slender chitinised processes, the superior forceps of hypopygium are long, but not very slender, with their inner margins minutely serrate on apical third, and the inferior forceps are cleft at apices with the branches of dissimilar lengths.

Length, 4 mm.

Type, Rock Creek, Washington, D. C., June 15, 1913 (R. C. Shannon).

***Sapromyza obtusilamellata*, sp. n.**

Male.—Similar in color to *quadrilineata* Loew, the apices of tibiae darkened.

The structural differences in the fifth sternite, which has two slender backwardly directed chitinised processes in this species which are absent in *quadrilineata*, and in the form of the hypopygial forceps, the superior pair of this process being short and stout, and the inferior pair with the apical branches of almost equal size, which in *quadrilineata* the superior forceps are long and slender, and the inferior pair have the apical branches unequal in size.

Length, 4 mm.

Type, and two paratypes, Glen Echo, Md., July 17, 1921; one paratype, topotypical, July 23 (J. R. Malloch).

***Sapromyza pictiventris*, sp. n.**

Male and Female.—Similar to *annulata* Melander in color, the abdomen having minute fuscous or brown dots at bases of the bristles on dorsum which are lacking in the three species dealt with above.

The fore femur has a comb of minute black setulae on apical third in this species and *annulata*, a character that is absent in the *quadrilineata* group. The new species is darker in color than *annulata* and the superior hypopygial forceps of male are short and stout, with their apices concave.

Length, 3 mm.

Type, Rosslyn, Va., May 1, 1913. Allotype and one female paratype, topotypical, April 23, 1913 (R. C. Shannon). Paratypes, male, Vietch, Va., June 9, 1912 (J. R. Malloch), male, Hyattsville, Md., August 3, 1912 (F. Knab); one male, 2 females, Plummers Island, Md., April 28, 1914, 5 females, on and near Plummers Island, Md., May 30 to August 5, and one female, Dead Run, Fairfax Co., Va., May 19, 1916 (R. C. Shannon).

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REVIEW OF MERCET'S WORK ON THE ENCYRTIDAE (HYMENOPTERA) OF THE IBERIAN PENINSULA.

BY P. H. TIMBERLAKE,

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All students of the Encyrtidae, one of the most interesting groups of the Chalcid-flies, can not fail to admire the recent work of Ricardo García Mercet, on this family.¹ The faunal area covered is the Iberian peninsula, thus inclusive of both Spain and Portugal, but as a matter of fact the work will serve probably almost equally well for southern Europe as a whole. As it is the only general work on the European fauna that has appeared since the years 1875 and 1876, it will prove to be especially valuable to American workers who wish a modern interpretation of the old European genera.

Mercet has brought together descriptions of about 225 species distributed in 91 genera. In 1875 Mayr described 102 species in 25 genera and included all of Europe at least ostensibly in his faunal region, although most of his material came from Germany and Austria. Thomson in his *Hymenoptera Scandinaviae* (1876) described 81 species in 24 genera from Sweden, and Morley in his list of British Chalcid-flies records 134 species in 24 genera from Great Britain. The great majority of the British species were described by Walker and are not recognizable except by study of the types. The actual number of species occurring in the Iberian peninsula probably is greatly in excess of those so far discovered by Mercet, but it would not be safe to make any prediction of the number that will ultimately be found there or to set any limit at present to this number. It is perhaps significant that the only Encyrtid which I have seen from Spain is not included in Mercet's work, and it is perhaps the most beautifully colored species that I have seen from any region.

The work is profusely illustrated with text figures which are admirable in general effect and apparently fairly accurate in details. The generic tables are admittedly artificial but nevertheless give accurate results. There are also tables to aid in the identification of the species in each genus when more than a single species is included.

¹Fauna Iberica. Himenópteros, Fam. Encrítidos. By Ricardo García Mercet. Museo Nacional de Ciencias Naturales, Madrid (Hipódromo), pages I-XI, 1-732, 292 text figures, Dec. 25, 1921. (Price 18 pesetas.)

Mercet has abandoned the classification of the group elaborated by Ashmead, but divides the Encyrtidae into two very unequal subfamilies, the Arrhenophaginae and the Encyrtinae. Although much can be said in favor of the abandonment of the tribes Ectromatini, Encyrtini and Mirini on account of the bewildering plasticity of the group whereby the same character may have been developed independently in different genera (as for instance the fascicle of hairs at the apex of the scutellum in *Encyrtus*, *Cheiloneurus* and *Chrysoplatycerus*), I still believe that these tribes are on the whole natural groups, but that the classification might be bettered is now self-evident. Mercet has overlooked the fact that Ashmead divided these tribes not so much on the dentition of the mandibles only, as on a combination of characters, the peculiar character of the abdomen of the Ectromotini being especially stressed.

Nevertheless, even if a combination of characters is used there is still room for confusion in the old classification (even Ashmead, himself, made errors in distributing his genera, in most cases from too superficial study of his material), as not a few genera show intermediate and annectant characters. It is therefore a great advantage at present to include all of the genera of the Encyrtinae in a single artificial table for the purpose of identification, and to leave the division into tribes to another place. This is largely what Mercet has done not only in regard to the generic tables, but also in subdivision of the Encyrtinae, as he divides the subfamily into twelve unnamed "groups" (p. 56-60), which with a little more elaboration might be elevated into tribes. Probably the future classification of the subfamily which is now becoming unwieldy through the constant discovery and description of many new genera, will tend towards the recognition of comparative numerous tribes. The number of these will necessarily have to be much greater than the three proposed by Ashmead, in order to attain to a desirable degree of homogeneity.

To return to a consideration of Mercet's work we find that Förster's *Eucomys* is used for *Encyrtus* Latreille, and the latter genus is credited to Dalman and used for the group of species to which Ashmead restricted the Thomsonian genus *Microterys*. *Microterys* in turn is misapplied to a number of species which mostly belong to *Syrphophagus* Ashmead. According to my interpretation Latreille's description of *Encyrtus* is sufficiently exact to apply only to *Eucomys* Förster, and the identity of (*Chrysis*) *infidus* (Illiger) with (*Pteromalus*) *scutellatus* (Swederus) is reasonably certain. But those who can not recognize Latreille's description and fall back upon Dalman's should not overlook the type fixation of "*Encyrtus* Dalman," by Curtis in 1832 and Westwood in 1840. Both of these authors selected *Encyrtus scutellaris* Dalman (= *scutellatus* Swederus) as the

type of *Encyrtus*, so that in either case the genus *Eucomys* Förster must fall as a synonym of *Encyrtus*.

Mercet deserves little credit for shifting the genotype of *Microterys* Thomson from *Encyrtus sylvius* Dalman, selected by Ashmead in 1900, to *Encyrtus aeruginosus* Dalman, thus transferring the name to much different groups of species, and in fact it is this refusal to recognize previous work that causes so much instability in nomenclature.

Outside of the application of the three generic names, *Encyrtus*, *Microterys*, and *Eucomys*, Mercet has shown commendable judgment in the use of the old European genera, although I believe that Westwood's genus *Ectroma* has not been correctly identified by modern workers including Mercet. The fault, however, goes back to Westwood himself as he cited (*Eupelmus*) *rufus* (Dalman) as the type of *Ectroma* in 1840, probably believing that his *fulvescens* was a synonym of *rufus*. Judging from the short description of *fulvescens* it is certainly quite a different species, but its actual position is difficult to determine. It would be better to use *Aglyptus* Förster in place of *Ectroma* of authors, and leave the question of the relationship of *Anusia* Förster and *Ectroma* Westwood open to further investigation by some worker who has access to Westwood's type.

Some 37 new genera and 5 new subgenera are described by Mercet either in the present work or in preliminary papers since 1916. Most of the new genera I believe are good but at least three synonyms are apparent. *Habrolepistia* is *Comperiella* Howard, 1908; *Masia* seems to be the same as *Paracalocerinus* Girault, 1915; and *Philodoceras* is *Mirastymachus* Girault, 1915, which I regard as a subgenus of *Xanthoencyrtus* Ashmead, 1902. On the other hand Mercet's *Leptomastidea* antedates my own *Tanaomastix* which must fall as a synonym.

Mercet also recognizes a number of genera proposed by American workers and it would seem not always with happy results. *Ooencyrtus* Ashmead is not correctly identified, and for it is used *Schedius* Howard, which is a synonym of *Ooencyrtus* by ordinary standards (*Schedius* differs only in having the scutellum of a duller sculpture than the mesoscutum). *Acerophagus* Smith, *Heterathrellus* Howard, and *Chalcaspis* Howard are not correctly used although the species included are similar in some respects to the type species. *Heterathrellus* as I pointed out some years ago has bidentate mandibles and is extremely close to *Anagyrus* Howard. *Chalcaspis* also had bidentate mandibles, but the antennae are much more clavate than in the species included by Mercet, the wing margin is not excised, the stigmal and postmarginal veins are equal in length, and in the male the antennae are much different, being similar to those in the genus *Alloцерellus* Silvestri, 1915, and *Habrolepis* Förster, 1856, with an elongated club and two short funicle joints, besides three

vestigial funicle joints incorporated into one side of the base of the club.

The single species included under *Philoponectroma* Brèthes is evidently a male *Anagyrus* and the males described under *Anagyrus* probably do not rightfully belong there. I have seen the males of a considerable number of reared species of *Anagyrus* and they always have the peculiar little scale-like hairs standing erect in a row on the sixth funicle joint and the base of the club. The original *Philoponectroma* is most probably the male of the genus *Paranusia* Brethes, which is hardly distinct from *Anagyrus*.

It also should be noted that *Aphycus nigratus* Mercet is preoccupied by Howard's species of the same name published in 1898, and that the original spelling of *Cheiloneurus* is not followed. For the genus *Tricladia* Mercet, 1918, the name *Tricnemus* is proposed by Mercet on account of *Tricladus* Enderlein, 1906, but according to American usage the change is unnecessary, *Tricladia* and *Tricladus* being sufficiently different. The generic name *Tyndarichoides* Mercet is preoccupied by Girault's genus of the same name (Proc. U. S. Nat. Mus. vol. 58, 1920, p. 189).

On the whole Mercet has produced an extremely valuable work which will prove to be indispensable to all students of this group, and deserves the congratulations of all workers interested in the classification of the Chalcidoidea upon its completion.

A NEW SPECIES OF ZORAPTERA FROM BOLIVIA¹.

By A. N. CAUDELL, Bureau of Entomology.

Dr. Wm. M. Mann, entomologist with the Mulford Expedition to South America in 1921-1922, brought back a single specimen of Zoraptera, a dealated female fortunately in almost perfect condition. It proves to be an undescribed species of *Zorotypus* apparently the most nearly allied to the nearctic *Z. snyderi* Cdl., but conspicuously differing from that species by being black in general coloration instead of light yellowish brown, and also by various structural differences as shown by the following description:

Zoraptera manni, n. sp.

Winged female, other sex and forms unknown.—General color black, the palpi, the mouth, the antennal sockets and intersegmental sutures and the last two segments of the antennae as well as the tips of the tibia and the tarsi pale; eyes margined with pale color except the lower border; the whole insect beset with black hairs and setae, both on body and appendages, those of the abdomen

¹Results Mulford Biological Exploration.—Entomology.

situated mostly along the margins and directed posteriorly. Morphologically somewhat similar to *snyderi* but separable from that species by various points of difference; the antennae are nearer those of *snyderi* than of any other described species; the basal and third segments are no more than one and one-half times as long as broad while in *snyderi* the basal is almost and the third fully twice as long as broad; in *manni* the second segment is slightly more than one-half times longer than broad while in *snyderi* it is not at all more than half longer than wide; the last two segments of *manni* are pallid, being in strong contrast to the rest of the segments, which are blackish; in *snyderi* the entire antenna is light yellowish or brown, the last two segments not strongly contrasted with the rest. Pronotum slightly broader than long, slightly and gradually narrowing posteriorly, the lateral margins gently bowed outwards.

Legs noticeably stouter than in *snyderi*, the posterior femora being but two and one-half times as long as broad while in *snyderi* they are fully three times as long as broad; the anterior femora are noticeably more broadened mesially than in *snyderi*; posterior femora armed beneath on the inner margin with ten stout spines, the basal one scarcely its own length from the base of the femora, the next one fully its own length from the basal one and the rest at gradually and slightly decreasing intervals, the distance separating each from the other being less than the length of one of them; the apical spine is longer than the preceding ones and very slender, being indeed scarcely more robust than some of the apical bristles on the dorsal surface, and like them also in being slightly curved, thus being scarcely different and therefore it should probably not be considered as a ventral spine but as an apical seta; the outer lower margin of the hind femora bears three long slender spines, or stout setae; in the apical half and along the dorsal surface is a series of apically directed setae in more than one row; the posterior tibiae bear rows of moderately stout setae, all directed towards the apex of the tibia.

Wings broken away, the stubs only remaining, the point of breakage being basad of the point of commencement of the venation and the stub appearing as two small projections as described under *Z. hubbardi* Cdll.² The abdomen is plump; cerci similar to those of *snyderi*, the apical style scarcely twice as long as the cercus, the lateral ones no longer than the cercus.

Entire length, from front of head to tip of abdomen approximately 2.7 mm.; of posterior femora, .69 mm.; of pronotum, .42 mm.; width, pronotum, .47 mm.

Type, a single dealated female, Rio Ivon, Bolivia, February, 1922; the Mulford Exploration, Dr. Wm. M. Mann, collector.

Type in collection of the U. S. National Museum.

Catalogue No. 25751.

Dr. Mann, in whose honor this interesting species is named, collected the type during a canoe trip up the Rio Ivon, a tributary of the Lower Rio Beni. A brief stop permitted a few minutes collecting along the shore, and among the insects taken was this single specimen of *Zorotypus*, found under the bark of a decayed log in abandoned termite galleries. As thorough a search as opportunity afforded failed to reveal other specimens.

²Proc. Ent. Soc. Wash., vol. xxii, p. 87 (1920).

Dr. Mann has collected termites extensively in many regions but has never taken Zoraptera in actual association with white ants. In termitaria in trees and in termite-built mounds where the occurrence of Zoraptera might indicate relationship with the termites, it was not found, though search for inquiline was made in many nests. Dr. Mann thus concludes that the frequent occurrence of Zoraptera in or near termite galleries is attributable to the similar environmental requirements of the two groups; this view is in accord with those previously recorded by the present writer.¹

DESCRIPTIONS OF BIBIO (DIPTERA) FROM THE CAROLINAS.

By W. L. McATEE.

Mr. C. S. Brimley sent the writer for description the material of all but the first of the species mentioned in this paper. Holotypes have been deposited in the U. S. National Museum.

Male of *Bibio rufithorax* Wiedemann.

The male of this species has never been described, but I am able to remedy the deficiency, since two males were collected by Mr. E. R. Kalmbach of the U. S. Biological Survey, at Myrtle Beach, S. C., April 22, 1919, in company with a female recorded in a previous paper,² and with which they agree in essential structural characters.

Two of the leading characters for recognition of the species are the short inner spurs of the front tibiae and the blackish fumose wings. The integument of the male is black almost throughout, the legs being somewhat tinged with brownish, the tibial spurs translucent reddish, and the humeral ridges yellowish. The hair upon the eyes is of moderate length, erect and black; that of the occiput, thorax, and anterior half of abdomen longer, pliant and grayish, of the posterior half of abdomen of the same texture but black in color; the hair of the legs is chiefly bristly in character and black.

Bibio rufithorax is an addition to the long list of Bibionid species in which the sexes are differently colored, the female being the brighter.

Bibio alienus, n. sp.

Two pairs of *Bibio* collected in copula at Raleigh, N. C., April 19, 1921, by T. B. Mitchell appear to represent an undescribed species. (Holotype male and allotype female designated.) The inner spur of front tibia is much shorter than the outer.

¹Proc. Ento. Soc. Wash., vol. xxii, p. 97 (1920).

²Proc. U. S. Nat. Mus., Vol. 60, 1921, p. 13.

Male.—Head and body black, the humeral ridges yellowish; short, erect hair upon eyes black; longer, flexuous hair of occiput dark, of thorax and abdomen whitish. The legs have the coxae, trochanters, tibiae and tarsi of first two pairs brownish to blackish, all femora reddish-yellow, hind legs of this color throughout, the joints more or less blackish distally. Wings nearly hyaline, a little fumose along costa, the stigma moderate in size, dark brown. Length of wing: 5-5.5 mm.

Female.—Head black, abdomen brownish-black, thorax and most of legs reddish yellow, front tibiae, hind coxae and tips of other leg joints blackish; hair of head, thorax and legs rather bristly, that of abdomen somewhat softer, pale reddish. Wings dusky fumose, darker costally, the stigma and veins near costa blackish. Length of wing: 7 mm.

The male of this species runs to *B. nervosus* in my key (op. cit. p. 7) but in the same sex that species has more abundant long hair on the occiput, more copious pubescence on thorax, longer hair on eyes, and darker wings. The female runs to *B. longipes* but has the hind coxae blackish, and much darker wings.

***Bibio afer*, n. sp.**

Male.—Inner spine of front tibia much shorter than outer; color black except humeral ridges and a stripe along the inner side of each hind tibia which are yellowish; hair of eyes and posterior half of abdomen black, of occiput, thorax and anterior half of abdomen grayish; hair of legs chiefly dark; wings dusky fumose darker along costa, stigma indistinct. Length of wings: 6.5 mm.

Holotype ♂ Raleigh, N. C., mid May, C. S. Brimley.

This species resembles *B. albipennis* in general form and color, but the wings being dusky fumose instead of distinctly whitish as in that species make it easily recognized; in *B. albipennis* the hind tibial spurs are broader and blunter also. In color and vestiture the present species is much like the male of *B. rufithorax*, but is more slender throughout, this being especially true of the hind legs.

***Bibio velorum*, n. sp.**

Inner spur of front tibia fairly long but still much shorter than outer; head, body and coxae black, humeral ridges yellowish; wings almost uniformly yellowish fumose; stigma small, blackish.

Male.—Rather long erect hair on eyes, much longer hair of occiput and top of thorax dark, of sides of thorax, coxae and abdomen pale, grayish. Hind legs elongate, femora and tibiae clavate, metatarsi enlarged, the apices of all joints and whole of last 2 tarsal joints dark, remaining portions reddish, tibiae and tarsi brownish to black; hair of legs tending to agree in shade with integument from which it springs but that of front legs wholly dark grayish. Length of wing: 8-8.5 mm.

Female.—Pubescence in general shorter and more bristly than in male but all tibiae and tarsi tend to be darker than the femora, all joints dark-tipped. Length of wing: 10-11 mm.

Four males and 2 females, Jefferson, N. C., mid Sept., 1912, C. R. Metcalf; among which a holotype male and allotype female have been designated.

This species agrees very well with the description of *B. scita* Walker (based on a female from Nova Scotia) so far as it goes, but the writer would rather risk making a synonym than a misidentification.

The species has some similarity to *B. femoratus* Wied but the legs are differently colored, and the wings yellowish fumose in both sexes, whereas in *femoratus* the wings are blackish fumose in the females and nearly hyaline in the males.

DESCRIPTION OF A NEW SERPHOID PARASITE (HYMEN.).

BY ROBERT FOUTS.

The National Museum has recently received from Mr. C. F. W. Muesebeck, Specialist in Parasitic Hymenoptera at Melrose Highlands, Massachusetts, specimens of a new species of Platygasterid recorded as having been reared from the clover seed midge, *Dasyneura leguminicola* Lintner. The preparation of a paper by Mr. L. P. Wehrle on the biology of *Dasyneura* makes it desirable to have a name for the parasite. The following one is suggested.

Inostemma leguminicolae, new species.

Female.—Length 1.3 mm. Robust; head a little less than twice as wide as long, as wide as the thorax, finely reticulate, of a scaly appearance; vertex rounded; lateral ocelli nearer to the eye margin than to the lateral ocellus; occiput without an impression, not separated from the vertex by a carina or ridge; frons above with a shallow longitudinal groove; antennae .577 mm. long, not especially thick (Fig. 1.); thoracic ratio: length 21, width 18, height 15; thorax

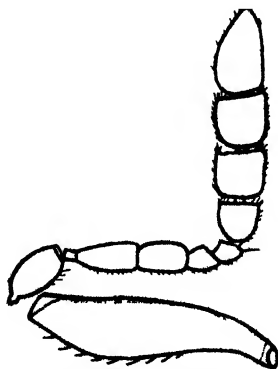


Fig. 1. *Inostemma leguminicolae* Fouts; antenna of female paratype.

shagreened, more strongly so on the pronotum and scutellum; notauli distinct not very deep; median lobe of mesonotum shallowly concave, shining, aciculate posteriorly; scutellum wider than long, depressed, scaly laterally, with a broad concavity posteriorly; abdomen one and one-half times as long as the thorax, .711 mm. long, twice as long as wide, distinctly but only very slightly, narrower than the thorax, acute apically; horn of first tergite regularly curved, perfectly cylindrical throughout, scaly, longitudinally aciculate laterally near the apex, its tip extending forward as far as the anterior margin of the pronotum; second tergite as wide as long, two-thirds as wide at base as at apex, polished, its surface posteriorly covered by very faint aciculae; broad basal fovea not sculptured; area at the sides of the basal fovea striate, the striae becoming very faint posteriorly; tergites three to five very finely reticulate, broadly transverse, diminishing in length posteriorly, each with its posterior margin polished; sixth tergite triangular, pointed apically, as wide as long, about as long as the two segments preceding, shagreened, rather thickly covered with short white hairs; the last four segments united three-fourths as long as the second is wide, becoming regularly narrower distad; wings hyaline, the anterior pair with a narrow marginal fringe, the posterior pair with a wider one; anterior wings 1.0 mm. in length. Black; apices of anterior tibiae yellowish-brown; all tarsi, except the last joint of each, brown.

Type-locality.—Ithaca, New York.

Type.—Cat. No. 25265, U. S. N. M. One paratype in the author's collection.

Host.—*Dasyneura leguminicola* Lintner.

Described from three female specimens reared by Mr. L. P. Wehrle. The dates of emergence are: September 17, 1920, (type) July 26, 1921, and January 2, 1922.

This is the second *Platygaster* species known to be parasitic on the clover seed midge. *Platygaster leguminicolae* Fouts (Proc. Ent. Soc. Wash., vol. 22, 1920, p. 69) has quite a distribution, having been collected in Oregon and New York.

AN EULOPHID PARASITE OF THE CHRYSANTHEMUM MIDGE (HYMENOPTERA, CHALCIDOIDEA).

BY A. B. GAHAN.

The following described parasite can not be connected with any published description and is believed to be new. Since Mr. C. C. Hamilton from whom the specimens were received contemplates treating of the species in a paper dealing with the host insect at an early date, advantage is taken of this opportunity to describe it and make the name available for his use.

***Tetrastichus diarthronomyiae*, new species.**

Belongs to the group having a distinct median groove on the mesoscutum and a single erect bristle on the dorsal side of the submarginal vein. Antennae with apparently four ring-joints, three funicle joints and a three-jointed club.

Female.—Length, 1.2 mm. Head finely and rather weakly lineolate-reticulate, the frons along the inner eye-margins with a few scattered punctures and the occiput a little more coarsely reticulated than elsewhere on the head; antennal pedicel subequal to or very slightly shorter than the first funicle joint; ring-joints minute; first funicle joint a little less than twice as long as thick; second joint slightly longer than the first and a little more than twice as long as thick; third joint subequal to the first; club subequal in length to joints two and three of the funicle combined and a little broader than the funicle, fusiform, the joints indistinctly separated by shallow sutures, the apical joint smaller than the others and terminating in a short spine; thorax robust, scarcely longer than broad, the mesoscutum and scutellum finely lineolated, the latter convex, a little broader than long with the two dorsal grooves distinct; propodeum medially very short, without a median carina, with distinct shallow reticulate-punctate sculpture, the spiracles placed in a small and very shallow depression which is nearly smooth; pleura weakly sculptured; marginal vein of the forewing nearly twice as long as the short submarginal and terminating very slightly beyond the middle of the anterior margin of wing; stigmal vein about one-third as long as marginal; joints of hind tarsi all subequal; abdomen slightly longer than head and thorax combined, nearly as broad as the thorax, conic-ovate in outline, with faint reticulations above and below; ovipositor not exerted. Head and thorax dark metallic bluish, often almost black; antennae dark fuscous to fuscotestaceous, the scape frequently almost black; the femora at apex, all tibiae and the middle and hind tarsi, except apically, pale testaceous; front tarsi entirely and the apical joint of median and hind pairs fuscous; wings hyaline, venation dark brown; abdomen black with bluish or bronze reflections above.

Male unknown.

Type-locality.—Baltimore, Md.

Type.—Cat. No. 25592 U. S. N. M.

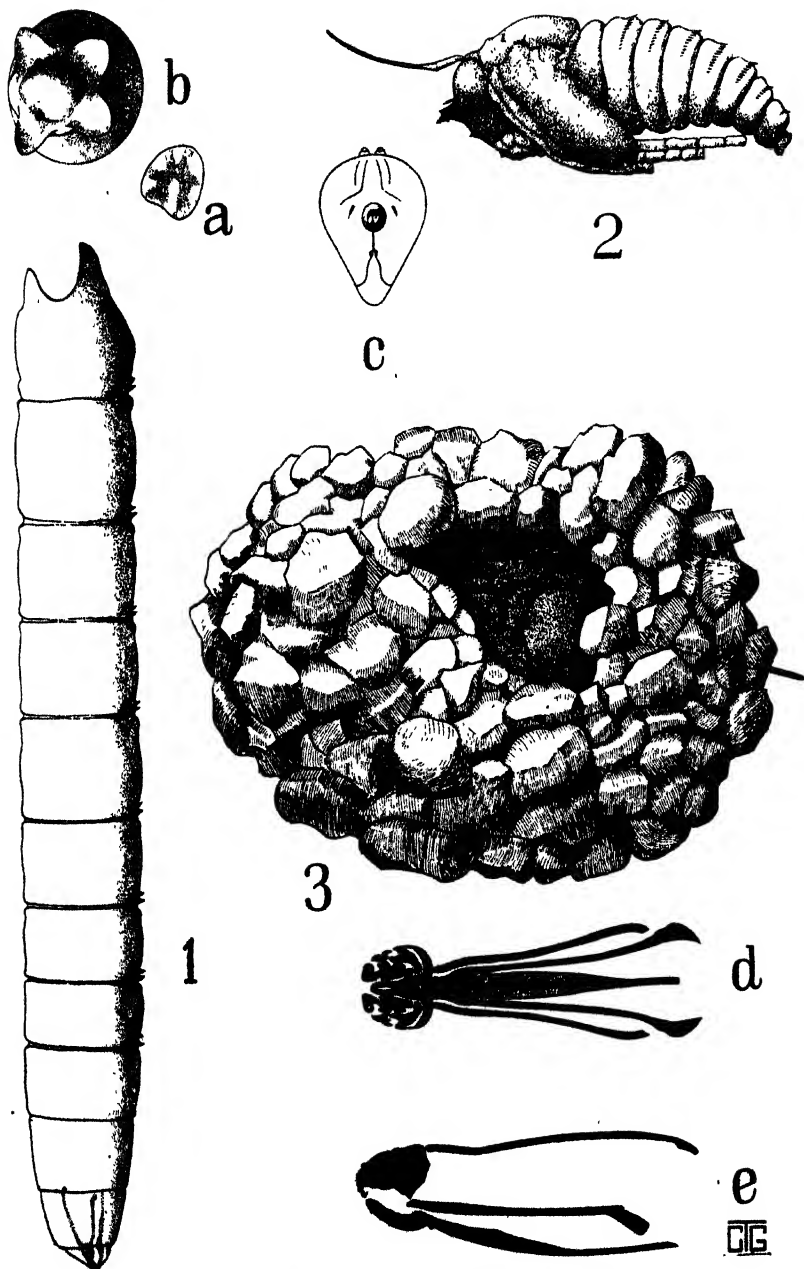
Host.—*Diarthronomyia hypogaea* F. Lw.

Type and twelve female paratypes mounted on card points and reared by C. C. Hamilton of the University of Maryland, December 30, 1921, from the above named Cecidomyid infesting chrysanthemums. Also nine paratype females from the same source mounted in balsam on a single slide.

THE IMMATURE STAGES OF HYDROPHORUS AGALMA WHEELER (DIPTERA).

By CHARLES T. GREENE, *Bureau of Entomology*.

The large family Dolichopodidae is well represented in many collections by adult material, and numerous species have been described from all parts of the world. The immature stages however are almost unknown having been described in only about six species. The genus *Hydrophorus* is known principally from the north temperate zone and includes about fifty-five species. The adults are found about the edge of water and



GREENE-HYDROPHORUS AGALMA.

frequently walk upon its surface. Up to the present time no immature stages have been known in this genus. The discovery of the larvae of the above species by Professor Charles H. O'Donoghue, of the University of Manitoba, Winnipeg, Canada, is therefore of uncommon interest. The material herein described was received from Professor O'Donoghue, who writes as follows: "The specimens were taken in water only a few inches deep on the north side of the spit where it joined the main ridge. The bottom here is a mixture mainly composed of sand with a little mud and owing to its sheltered position is practically undisturbed." An interesting thing about the larva is that the cell which it makes is too short to permit it to lie straight. Each of the cells opened contained one larva and the head was bent backward over the dorsum, the two ends nearly meeting. The two upper lobes at the caudal end of the larva can be folded down over the stigmal plates, probably to protect them. The long anterior spiracle of the pupa projects through the sand cocoon about the length of the last joint.

***Hydrophorus agalma* Wheeler.**

(Plate 5).

Proceedings California Academy of Sciences, Vol. 2, No. 1, 3d Ser., 1899, p. 66, Plate 4, figs. 120, 121.

Larva (fig. 1).—Small, cylindrical, yellowish-white, nearly opaque; there are eleven segments of unequal length, last segment somewhat globular, and a small segment at the head which is very often retracted; cephalic end tapers slightly towards the head; caudal end has four lobe-like projections, two above and two larger ones below; the lobes are flat, fleshy, rounded and tapering slightly towards the apex; on the ventral surface there is an area along the apical edge of the last eight segments which is covered with short, pale yellow, chitinous pointed spines used in locomotion; the mouth hooklets (*cephalopharyngeal skeleton*) are large and heavily chitinized and retractile (fig. 1 d, e); the posterior end (fig. 1 b) has the appearance of a faint cavity; above its center and towards the outer edge are located the posterior spiracles; the spiracle is at the center of the base of the upper lobe; each spiracular plate (fig. 1a) is chitinous, brownish-yellow, nearly round with a slight indentation on the upper, outer edge; the surface is flat with a dark brown area reaching the outer edge at six different places; the two upper lobes can be folded down over the spiracular plates; they are semi-transparent and the spiracles can be faintly seen in the lateral view.

Length, 6.5 mm., diameter 1 mm.

Berens Island, Lake Winnipeg, July, 1918, Prof. Charles H. O'Donoghue, Collector.

Pupa cells or cocoon (fig. 3). Cylindrical, a little longer than its diameter; made entirely of sand and held together by a transparent, colorless, gelatine-like substance; inside is a cell just large enough to hold the pupa.

Length, 7 mm., diameter, 4.5 to 5 mm.

Pupa (fig. 2).—Small, robust, yellow; anterior spiracles are quite long, slender,

three joints of equal length; first joint pale yellowish-white, swollen in the middle and tapering towards each end; second and third joints very slender, cylindrical, dark brownish-yellow, with a black band at the base; in the middle of the front of the head is a black, heavily chitinized tubercle (fig. 2 c) which is divided into four sharp points at the apex, the larger points below; on each side of the center is a very slender, small, cylindrical, yellow tube-like projection with a fine bristle at the apex; the head and all the thoracic parts are dark yellowish-brown; leg capsules are paler towards the apex. Abdomen is composed of nine segments, the apical one is very small; abdomen is a pale, whitish-yellow and tapers nearly to a point at the apex; on segments two to eight there is a transverse dorsal row of brownish-yellow, sharp-pointed, bristle-like spines; this row is slightly above the middle of each segment and the spines in the middle of the row are a little longer than those at the ends.

Length, 4 mm., diameter (at thorax) 1.5 mm.

THE ROLE OF THE TAXONOMIST IN PRESENT DAY ENTOMOLOGY.¹

BY A. B. GAHAN.

My first inclination was to entitle this screed "The Tax on Taxonomists," but lest some might interpret this title as pre-saging the advocacy of some new and radical form of revenue production, or still worse as a wail from a disgruntled systematist anent his own hard lot, rather than the cheerful ebullition of one thoroughly contented with his job, and who revels in the difficulty of it, the less dangerous but somewhat more inclusive title of the "Role of the Taxonomist in Present Day Entomology" was substituted.

It is not an easy matter for one working in a purely taxonomic field, and that a strictly limited one, to choose a subject for an address which will be of interest to the general membership of this society. Inured though I know it to be to varied brands of verbal bombardment, I have no desire to go down in the annals of the Society as the one who added the proverbial last straw. Bearing in mind this hazard it was not without considerable trepidation that I chose as my subject for this occasion the theme indicated by the title. If what I am about to say does not come up to expectations, I beg of you to place the blame upon the precedent which makes it necessary for a retiring president to deliver an address rather than upon the unlucky individual who happens to be the chief victim of that precedent.

A Bit of Speculation.

An entomologist may be defined as one who is interested in the study of insects.

It seems reasonable to suppose that man's first interest in

¹Annual Address of the President.

insects probably came about through the bodily discomfort occasioned by their ravages upon his person rather than upon his sources of food supply. Anthropologists tell us that earliest man was a creature much given to the simple life, and prone to seek his sustenance in the chase and by foraging, rather than through the arts of husbandry. It therefore follows that he probably was little impressed by Arthropods except as their bites or their perambulating propensities irritated him by day or disturbed his slumbers by night.

It might well be that the first entomologist was contemporaneous with the first flea, or at least with the first establishment of mutual acquaintanceship between the genus *Homo* and the genus *Pulex*. One can readily imagine the quick interest that must have been engendered in our shaggy ancestor when the first of these six-legged tormentors landed perhaps upon the exact spot which could not be conveniently reached, and began to "bore in." Also his further surprise and aroused curiosity after the intruding *Pulex* had finally been dislodged and chased into the open, to find that when he would crush it with a hairy thumb or fore-finger, he but bruised his digit, while the elusive visitor hopped merrily away. At such a time what more natural than that there should arise in his mind the question "What is it?" And, behold! We have the genesis of the modern entomological taxonomist, for it is exactly that question which the taxonomist is eternally trying to answer.

Whether to *Pulex*, or to some one of several other insects belongs the distinction of thus having implanted the idea which developed the modern taxonomist, is not essential to the point. The fierce stab of *Culex* the mosquito, the annoying familiarity of *Pediculus* the cootie, the stealthy nocturnal foraging of *Cimex* the bed-bug, or the murderous attack of *Vespa* the hornet, would any one of them probably have produced the same reaction.

As the struggle for existence became more keen, and man was gradually driven to take up the art of husbandry, his interest in insects must have received a powerful added impetus. When by the sweat of his brow and at the expense of blistered hands and a lame back, he had brought his small garden patch to the point of anticipated fruition, only to see it devastated and wiped out by a horde of hungry grasshoppers (or locusts if you belong to that school), he no doubt often became discouraged and wondered, as sometimes does his modern successor, whether it was worth while after all. One can readily picture him returning from an unsuccessful hunt to find that in his absence the plague had descended upon his little clearing and that his one remaining hope of a means of appeasing his appetite was rapidly disappearing. In his rage he possibly seized the first weapon at hand and began threshing about among his plants with the idea of revenging himself upon the despoilers. At the

sudden commotion the "hoppers" probably hid themselves away a short distance out of danger and faced about to see what was happening, as modern "hoppers" have a habit of doing. If this particular ancestor chanced to be of a wide awake and original turn of mind, an idea may have popped into his head at this point. This idea would have been something on this order, "If they (the hoppers) are afraid of me and fly before me, why not drive them out of my garden." Here perhaps was the genesis of the economic entomologist. As illustrative of the value of a really good original idea, it may be stated without prejudice to the economists, that the method is still in use, as witness the measures employed to-day in the battle against grasshopper outbreaks in South Africa and elsewhere.

So far I have dealt mostly with pre-historical facts or fancies, whichever you choose to call them. In thus permitting my imagination this slight indulgence, I trust I have not wandered too far from fact, nor transgressed too greatly the accepted rules which prescribe that scientific discussion must be dignified. If unhappily I have done so, I shall hope to make partial amends in what follows.

Having established a possible pre-historic beginning for taxonomy, as well as the economic phase of entomological research, we will next consider briefly and in a very general way its progress in the light of recorded history.

Early History of Taxonomy.

Dr. C. L. Marlatt in a presidential address before this society in February, 1897,¹ gave an extremely interesting historical survey of the literature of the science of entomology. He points out that while figures and sculptures of insects occur upon the monuments of ancient Egypt, and while incidental references in the writings of Moses and the early Chinese scholars are common, the first study of insects to which any importance can be attached began with Aristotle, more than three hundred years before the beginning of the Christian Era. Dr. Marlatt traces the history of the development of the science in more or less detail through the succeeding centuries down to the beginning of the present century. It is not necessary therefore, even if my limited knowledge of the subject would so permit, for me to attempt to go into a detailed review of this ancient literature. Suffice it to say, that the period of approximately 2100 years which elapsed between the time of Aristotle and the time of Linnaeus, was productive of much necessary work on the metamorphosis, anatomy and physiology of insects, as well as several scarcely successful attempts at classification. This pioneer work, forming as it undoubtedly did, a foundation for

¹Proc. Ent. Soc. Wash., vol. IV, 1897, pp. 83-120.

the work of Linnaeus and those who follow him, was of great importance, and represented no small advance since the time of Aristotle.

The most interesting and important development during the period, from the standpoint of the present discussion, was the attempt by Swammerdam in his "*Biblia naturae*" or "*Bibel der Natur*," published in 1737-8, at a classification of insects, using metamorphosis as the basis for primary divisions, and characters taken from the adults as the basis for smaller groups. This work was very imperfect and incomplete, but represented a considerable step forward, and undoubtedly exerted a more or less profound influence upon the work of those who followed. That the science was still in a very primitive condition, however, is apparent. The theory of spontaneous generation had not yet been entirely discarded; the number of recognized genera and species of insects was surprisingly small; no satisfactory or workable classification had yet been evolved, and in lieu of a system of nomenclature the cumbersome descriptive paragraph was still in use. Economic practice during the period seems largely to have taken the form of prayers to the Almighty for deliverance from outbreaks, and of appeals to the courts for judgments against insects. The latter practice was so general during the Middle Ages, that special rules and highly imposing legal forms and ceremonies were developed by the courts for the handling of suits against insects, as has been entertainingly described by Dr. L. O. Howard, in an address before the Association of Economic Entomologists in 1894.¹

Modern Status of Taxonomy.

In spite of the interest attached to the pre-Linnaean evolutionary period, it is nevertheless apparent to every student of entomology that for all practical purposes the real history of the science dates from the publication of the 10th edition of Linnaeus. For centuries the study had been floundering about like a rudderless ship on an uncharted sea, occasionally making a little progress in one direction or another, but for the most part, getting nowhere. Under the guiding and steadying influence of the binomial system of nomenclature, and with a workable classification serving as a chart, the good ship immediately took up a straight course and has made continuous progress ever since.

Following publication of the various editions of Linnaeus came a period in which taxonomic investigation monopolized practically the whole field of entomology. Fabricius with his

¹Insect Life, vol. VII, 1894, pp. 55-108.

classification based almost wholly upon the mouthparts, came and went. Latreille, to whom is due the credit for first properly limiting the Class Insecta, as well as for harmonizing and welding into a natural system based on a combination of metamorphosis, wings, and mouthparts the conflicting systems of Swammerdam, Linné and Fabricius, also accomplished his purpose and passed on. Thunberg, Olivier, Illiger, Schrank, Panzer, Kirby and Spence, Meigen, Fallén, Cuvier, DeJean, Spinola, Klug, Say, Gravenhorst and many other illustrious names are associated with the period.

This was the formative period in entomology; the period when the foundation started by Linnaeus was expanded and strengthened to carry the great superstructure which was to be erected upon it; the period in which collections were acquired and facts accumulated, sifted and associated; in which classifications were laboriously built up, picked to pieces and wholly or in part discarded. Out of it all came a rational and workable classification which forms the basis for all our knowledge, both systematic and economic, to-day. What has been done since has simply amplified and extended the original structure started by Linnaeus and his immediate successors.

A thought which I particularly want to impress is this: that the ground work, the foundation of the whole immense entomological structure of to-day is essentially taxonomic. Prof. Raymond Pearl of Johns Hopkins University in a recent address,¹ makes this significant statement, "The first step toward a proper knowledge of the phenomenal world is obviously to get the phenomena classified in an orderly scheme. In biology this takes the practical form of getting the different kinds of plants and animals described, named and classified." The truth of this statement can not be gainsaid. Objects without names can not well be talked of or written about; without descriptions they can not be identified, and such knowledge as may have accumulated regarding them is sealed; unclassified their relationships are unknown and the possibilities of deduction are destroyed. In short, without the fundamental work of the taxonomist the great mine of entomological literature would not exist, and the accumulation of knowledge would be largely limited to what one could personally observe and remember.

Linnaeus was able to classify all of the known animals and plants of his time. It is difficult to imagine any one so intrepid as to attempt the same thing to-day. In the field of entomology alone, the task would be too vast to be accomplished in the span of one lifetime. The mere task of consulting the literature would preclude the possibility of doing anything else. Marlatt

¹Science, vol. LVI, 1922, pp. 581-592.

in 1897 estimated the number of published volumes on entomology of 500 pages each at between twelve and fifteen thousand with an annual accretion, exclusive of economic matter, estimated at 75 volumes. I believe this estimate of the annual accretions to be too conservative to apply to the present. In fact it seems to me probable that the present-day output of America and her possession alone must be very close to that figure. With a dozen or more journals devoted entirely to entomology and each publishing a yearly volume of greater or less extent; with numerous museums maintaining entomological departments and publishing articles in one form or another; with practically all of the forty-eight states as well as several of the insular possessions maintaining corps of entomologists in their experiment stations or agricultural colleges, and frequently in their universities as well; with the Federal Bureau of Entomology turning out bulletins and papers at a prodigious rate, it seems fairly certain that the total annual output from all of these sources can not fall far short of Marlatt's estimate for the whole world in 1898.

Be that as it may, the fact is apparent that no one could hope to compass the whole field of entomology to-day; hence, the specialist. The tendency to specialize manifested itself even among the pupils and immediate successors of Linnaeus, as we find Meigen, Fallén, Weidemann and Zetterstedt devoting themselves mostly to Diptera; Lepelletier, Gravenhorst and Klug to Hymenoptera; Hübner and Esper to Lepidoptera, etc. At first specialization seems to have been by orders. As the field expanded, as more genera and species became known, as more men and women were drawn into the study of the subject, as the literature became more and more extensive and complicated, the tendency to narrower and narrower specialization has kept pace. A few present-day specialists of unusual capacity and enthusiasm still manage to cover a whole order (as witness my good friend A. N. Caudell), but for the most part, specialization in the larger orders like Diptera, Hymenoptera, Lepidoptera and Coleoptera is by subdivisions of the order, not infrequently by families or sub-families.

This tendency to specialize in a narrow field is frequently the subject of disapproval or even condemnation by certain writers. No doubt it is to be regretted, but it is nevertheless the outgrowth of perfectly natural causes, and causes for which there appears to be no remedy. Just as in the field of mechanics no man is now expected to know all there is to know about the various lines of engineering, so in entomology the human capacity is limited, and if one would accomplish anything in his natural lifetime, he must forego the pleasure of knowing the whole subject, and specialize, and that along comparatively narrow lines. A good illustration of the growth of the science,

as well as an excellent illustration of why in this day it is necessary to specialize, is to be found in the fact that Linnaeus knew but 74 genera of insects, while the recent compilation of a genotype list of the Chalcidoidea reveals the occurrence of over 1900 generic names in that Hymenopterous superfamily alone.

Having shown that the science is founded on the work of taxonomists, let us for a few moments study the relation of the taxonomist of the present day to his subject. Early systematic workers took up the study either as a pleasant recreation and relief from less interesting duties, or as an adjunct to some other line of philosophical investigation. The professional entomologist was unknown. Since he was under no obligation to any one so far as his entomological studies were concerned, the early worker presumably could follow whatever line of investigation pleased his fancy.

The systematic worker of to-day is in quite a different position. More often than not he is on a bread and butter basis, i. e., earning his livelihood through his entomological endeavors. In most cases it is probable that he was drawn into the work by the same influences which attracted the earliest workers to it, viz., the interest and fascination inherent in the study itself. Probably it is true also, that the particular group upon which he specialized was more or less of his own choice. But once established as a systematist in a particular group and having associated himself with some institution of learning upon which he is dependent for a salary, he is very apt to find that he is no longer free to follow untrammelled his own inclination in the matter of the lines which his investigations will follow. In entomology, as in all other sciences, economic considerations now largely influence and often determine the direction of pure research. Not only is the systematic worker apt to find himself unable to follow his own inclination regarding the particular group or groups he will investigate, but he is very fortunate if he does not find himself so swamped with demands for determinations and other information that he is unable to do any real research work at all. The tremendous world wide interest in economic entomology has resulted in swelling the number of economic workers to a veritable army, while the number of systematists has apparently not kept pace. As a concrete example I may state that in the whole world to-day there are probably not over a dozen individuals actively engaged in the taxonomic study of Chalcid-flies, notwithstanding the fact that the interest in parasitic insects is greater than ever before, and this group is probably the most numerous of all the parasitic forms. In most cases these systematists are not pretending to cover the whole super-family, but specializing upon one or more large families. The consequence is that the determination and classification of the specimens in a certain family for all the economic workers

of the world may fall upon two or three individuals. This would be an ideal state of affairs, perhaps, if the specimens and individuals sending them in were not quite so numerous, since it would give the systematist a world-wide view of his subject. But with the present demand for information what it is, the actual result is the swamping of the systematist with determination work, with resultant dissatisfaction to both him and the one sending the specimens.

In the address of Prof. Pearl from which I have already quoted I find this: "One forms the opinion that perhaps four-fifths of the Ph. D's turned out in zoology at the present time, not only never have, but probably never will for themselves identify an animal strange to them, and as for deciding whether the unknown creature has been previously described, or placing it in proper taxonomic relation to its nearest relatives, such a problem would be as far beyond their powers as it is beyond their desires." Prof. Pearl is in a position to know whereof he speaks. The entomological portion of this same four-fifths of the Ph. D's presumably goes into the universities and colleges to teach, or into the Experiment Stations or the U. S. Dept. of Agriculture to engage in investigational work along economic lines. Having neither power nor desire, or if they have these, usually lacking the facilities to find out for themselves what a particular insect constituting their problem may be, they must seek help. And who but the systematist can help them? Given the name, if the insect happens to be one with a history and they are at all familiar with bibliographic work, which they frequently are not, they have the key which unlocks all that is known about it. Without its name they are helpless.

But all of the demands for names and information does not come from these Ph. D's who have become professional entomologists. The postgraduate student or embryo Ph. D's demand the help of the systematist in completing their theses. The undergraduates and high school students must have names for their specimens in order to get credits. Then there is the private collector who maintains a collection but often does not know enough about his hobby to name his specimens himself and sends them to the specialist, frequently with the stipulation that they must all be returned with a statement as to their position in the classification, their habits, importance, etc. Among them all, the systematist does not lack for something to do. In fact, he frequently finds work piled up ahead sufficient to keep him occupied for months or even years. The resulting delay is aggravating to the worker who waits for his names, and it is equally discouraging to the systematist who sees himself hopelessly cut off from doing any of the necessary constructive classification work which he had planned to do.

And this brings me to a consideration of the possibility of

relief. The one and perfect remedy would be an immediate and substantial increase in the number of working systematists. Unfortunately this is a remedy which can not be applied immediately. Taxonomy does not carry the same appeal to the popular mind as does the economic phase of entomology, for the reason that its results are less tangible and its importance is not appreciated because not understood. It is very doubtful therefor whether federal, state, or private funds would be forthcoming for the employment of any considerable number of additional taxonomists even if trained individuals were available, which they are not. It is probable that the universities and colleges would be glad to train young men and women in taxonomy were there a real demand for their services; but notwithstanding the very apparent need for more taxonomic work, there is manifested by institutions no disposition or desire to take on more taxonomists and consequently there is very little incentive for universities and colleges to turn them out. This is to be regretted for several reasons. First, because until such time as the supply of trained and working systematists is brought up to the point where they are sufficient to handle with reasonable promptness the work expected of them, the economic side of the work must suffer delay. Second under present conditions the taxonomic worker is prevented from doing the careful work which the situation demands and which would be a credit to him. Third, when the present crop of systematists passes on as they inevitably must, there are in many instances no younger understudies who can step into their places. A crying need of the hour then, it seems to me, is a realization that the dearth of taxonomists is seriously handicapping and retarding the progress of the science as a whole and will continue to do so to an increasing extent unless steps are taken to make up the deficiency.

It will not be amiss to point out that in the meantime it is possible to afford some partial relief. Many times the motive which prompts a field worker to send specimens to a specialist for determination is idle curiosity. Idle curiosity is commendable enough so long as it does not impose a hardship upon some one else. In fact much of the progress of the world was no doubt brought about through idle curiosity. But if the aforesaid field worker will simply pause long enough to consider whether or not the determination of certain specimens is of any importance to him, whether he actually needs a name for them or not, many times he will decide that a name is not necessary and will send them to the specialist with the stipulation that they are for the collection and not for immediate determination. By such a method material would be accumulated which would be invaluable in case revision of a particular group were undertaken, while the specialist would be relieved, in part at least, of

the bugbear of miscellaneous determination and description and could devote more time to the revisionary work which is so necessary.

Another way in which the field workers and students could aid the specialist materially is by seeing that their specimens are properly mounted and labelled. There are few things which ruffle a systematist's nerves more than to have a lot of improperly mounted, broken or dirty specimens, or specimens unaccompanied by requisite data handed to him for definite determination. Prof. T. D. A. Cockerell in an unpublished letter once estimated that on the average it took the specialist at least four times as long to name a specimen as it did for the collector to collect it. This estimate is probably much too small when applied to some of the less well known groups. If the specialist was only familiar enough with his group to be able to name on sight anything which came into his hands, the problem would be simple enough. But unfortunately this is seldom the case. The genera and species are far too numerous for one mind to retain them all. The published classifications are in many cases several years out of date and consequently do not include many of the new genera and species. The determination of a single specimen therefore is often a matter of hours or even days of searching through literature before the particular description covering the specimen at hand is found, or before the possibility of a published description is eliminated and one can proceed to describe it. In view of these facts the systematist should not be too severely criticised if sometimes the determination of a given specimen is not returned as promptly as anticipated. Neither should he be considered a crank and a crab if he sometimes grumbles at receiving a consignment of specimens so mounted as to be unfit for examination, or as frequently happens, a lot which he must himself mount before he can study.

Conclusion.

In conclusion I wish to quote once more from the address of Prof. Pearl as follows: "It is the systematist who has furnished the bricks with which the whole structure of biological knowledge has been reared. Without his labors the fact of organic evolution could scarcely have been perceived and it is he who to-day really sets the basic problems for the geneticist and the student of experimental evolution." If I, in this address, have to some slight degree succeeded in impressing my hearers with the truth of these words of Prof. Pearl as applied to the science of entomology, and if at the same time I have given the economic workers among you some slight insight into the difficulties which surround the work of a present-day systematist, I have succeeded beyond my expectations and am satisfied.

THE EUROPEAN AMALUS HAEMORRHOUS HBST. IN THE UNITED STATES (CURCULIONIDAE).BY L. L. BUCHANAN, *U. S. Biological Survey.*

A specimen of this Ceutorhynch, taken near Syracuse, N. Y., by Mr. M. H. Hatch, was recently sent me by the collector. *Amalus haemorrhous* is recorded by several European writers as occurring on *Calluna vulgaris* (heather), and as this plant is naturalized in the coastal region from Newfoundland to Rhode Island, it is not unlikely that the weevil may become established over the same area. The following brief description should make its recognition easy:

A small, oblong, robust weevil, upper surface black, the elytra sometimes reddish. Beak as long as head and thorax, rather stout, weakly curved. Thorax without tuberosities or ocular lobes, anterior margin not reflexed, no sign of a prosternal sulcus. Fore coxae very narrowly separated. Antennae and legs red, femora unarmed, 3d tarsal joint bilobed, claws with a minute basal tooth. Funicle 6-jointed. Elytra with a scutellar spot of white, oval scales, and another similar spot along suture at apex, rest of surface with rows of very fine hairs. Underside with relatively large white scales, which are mostly slightly separated. Length, 1.7 mm.

Among our genera *Amalus* will fall in the group *Phytobii*. Its most noteworthy diagnostic features are the red legs and antennae, approximate front coxae, lack of thoracic tubercles, ocular lobes and sternal groove, and 6-jointed funicle.

THE HOST PLANT AND HABITS OF ACANTHOSCELIDES GRISEOLUS (FALL) (COLEOPT.).

BY J. C. BRIDWELL

Among the plants producing a fiber of minor value are some of the species of the leguminous genus *Sesban* or *Sesbania* of which a species known as *S. sesban* or *S. macrocarpa* is generally distributed in Florida and Texas and in Arizona and California in the Colorado River valley, in Mexico from Baja, California, and Sonora to Guerrero and Vera Cruz and in Central America, and has become established in the Hawaiian Islands. The seeds contain an oil which may ultimately prove commercially useful.

The writer has already recorded¹ finding the seeds of this plant attacked in Hawaii by *Bruchus pruininus* Horn, an American species of general feeding habits native to Texas, Mexico and the other States on the Mexican border. In his field work on the natural enemies of the Bruchidae this plant was examined for Bruchidae at New Orleans and near San Antonio, and

¹Proc. Haw. Ent. Soc. 3:469, 1918.

Brownsville, Texas, without finding infestation by this species or any other.

It has, however, been known for some time that this plant was infested in the Colorado Valley by a Bruchid. There is in Dr. Chittenden's material of Bruchidae a considerable series of a Bruchid which I have determined as *Acanthoscelides griseolus* (Fall), and I have determined other material in the collection of Dr. E. C. VanDyke and in the National Museum as this species, all of it from the lower Colorado River Valley. Through the kindness of Mr. Roland McKee of the Bureau of Plant Industry I have been able to examine a lot of seeds of *Sesban sesban* from Bard, California, near Yuma, and from this material the following notes have been mainly drawn.

The *sesban* is a tall shrub with drooping branches dying back to the ground in the winter in this country but persisting and becoming a small tree in the tropics and the long and slender pods are pendant on the branches six inches or more in length and remain attached until they have split open. Dehiscence is gradual and for a long time the seeds remain in the pod and the adult females have abundant opportunity to oviposit among them, the long ovipositor permitting them to be placed within the pod through the narrow opening if the adult is not able to enter. In the material at hand none of the pods are present and it is not possible to be sure if the eggs are ever laid upon the pod but the eggs present in the material are nearly or quite without cement material and seem but lightly, if at all, attached to the seeds, so that it is likely that they are usually laid within the pod in concealment. They are elongate elliptical in outline and apparently a little less than twice as long as broad. The egg shell is thin and delicate.

The seeds are sub-cylindrical truncate at the ends, about 4 mm. long by 2 mm. wide and each serves to nourish a single larva, the entire contents of the seed being destroyed in its development. The material examined has more than fifty per cent of it been destroyed by the weevils and doubtless the rest would have been eaten if it had not been fumigated. This species is unknown from any other locality besides the Colorado Valley where it is exposed to very high degrees of heat and dryness. The material has been parasitized by some Chalcidoid parasite or parasites but no material was found in condition for determination.

The host plant is not at present of any economic importance but *Acanthoscelides griseolus* would likely become a serious pest if the oil of the seeds should ever warrant its cultivation. No other host plants are known for this species.

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DISTRICT OF COLUMBIA DIPTERA: BIBIONIDAE.

By W. L. McATEE.

The Bibionidae are small to medium-sized chiefly black flies of vacillating flight. They occur only in spring and fall, sometimes very early or very late; the species usually are numerous in individuals. No keys are included in this paper since my "Notes on Nearctic Bibionid Flies"¹ contains a synopsis of all the genera and species. The number (9) of species listed is one less than recorded in the list of New Jersey diptera. (Ann. Rep. N. J. State Mus. 1909, pp. 734-5.) All of the species have been collected on Plummers Island, Md., home of the Washington Biologists' Field Club. *Dilophus spinipes* Say has been collected at Potomac Run, Va., and to the westward of our region, hence should sometimes be collected here. It would seem reasonable to expect here also *Dilophus breviceps* Loew, *Bibio basalis* Loew and *B. rufithorax* Wiedemann.

Annotated List of Species.

Genus *Plecia* Wiedemann.

Plecia heteroptera Say.—Generally distributed and not rare in its season which as at present known extends from Sept. 23 to Nov. 11.

Genus *Bibio* Geoffroy.

Bibio abbreviatus Loew.—A common spring fly that has been collected throughout the region at dates ranging from April 15 to May 10; is known to be attracted to light, and has been taken on the flowers of *Brassica campestris*.

Bibio albipennis Say.—Sometimes very abundant; has been collected from May 4 to June 9; however there is only one June record, the latest previous date being May 23; taken on flowers of *Ranunculus bulbosus*.

Bibio femoratus Wiedemann.—The largest local species of the genus; generally distributed and on the wing from April 18 to May 7; in copula, April 22 and May 2; comes to light.

Bibio fraternus Loew.—Very common; has been collected from April 20 to May 10; in copula April 28; is attracted to light.

Bibio longipes Loew.—A common fall species; dates of collection run from Sept. 9 to Nov. 21.

¹Proc. U. S. Nat. Mus. Vol. 60, 1921, pp. 1-27.

Bibio slossonae Cockerell.—Plummers Island, Md., Nov. 18, 1906, Nov. 17, 1907 (McAtee); there is good reason for believing that this form is a northern subspecies of the preceding, and that the specimens here recorded are merely the intergrades that would be expected in a locality where the fauna derives numerous species from the mountain (equivalent faunistically to a northern) region.

Genus *Dilophus* Meigen.

Dilophus obesulus Loew.—All specimens are from the vicinity of Plummers Island or from farther up the Potomac River; they were collected from May 4 to 26; and on one occasion each at light, and on flowers of *Opulaster opulifolius*.

Dilophus serotinus Loew.—Sometimes abundant; the known season extends from Sept. 28 to Nov. 18; in copula Oct. 19, and 30.

A CONTRIBUTION TO THE BIOLOGY OF N. A. DIPTERA.

BY CHARLES T. GREENE, *Bureau of Entomology.*

The immature stages of the Diptera discussed in this paper were reared by the writer at the Eastern Field Station, Falls Church, Va. The material was collected by the writer, except where noted. These descriptions of the immature stages are new to science. *Xylota pigra* was described briefly but no figures given. There were so many good characters on the pupa I thought it worth while describing in detail. All the species treated in this paper pupate in the last larval skin.

The writer has made a distinction between the two pairs of anterior spiracles of the pupa. The small ones located close to the apex are called "*anterior spiracles*." They are present in the full grown larva and the pupa. A short distance in back of this pair, on the dorsum, is a larger pair which appears only in the pupa and this pair I have called "*antero-dorsal spiracles*."

Microdon coarctatus Loew.

(Plate 6, figs. 1a-b)

Larva small, dull, smooth, opaque, milky-white; about one and one-half times longer than wide; height is about three-fourths the width; on the ventral surface, near the lateral edge, but not visible from above, is a row of fine, soft, delicate hairs which entirely encircle the ventral surface. Around the edge near the base are located thirty small cone-like projections arranged in pairs; on the dorsum are numerous others of these same cone-like projections; these cone-like projections are located on a small, short stem with a diameter about equal to the length; the cone portion has the diameter at the base about or nearly equal to the height and the color is yellowish-brown. These cones are very easily knocked off but there is always a definite scar at the point of attachment. Posterior

spiracles are located at the apex of a large cone which is located well above where the side and ventral surface meet; this cone is of a medium dark, brownish-yellow, somewhat chitinated and pointing slightly oblique from the ventral surface. Where this cone attaches to the larva is a circular base, chitinous, brownish-yellow, tapering towards the apex and at the apex is a narrow constricted space and then the cone; the diameter at the base is about equal to the height.

The spiracles (fig. b. right half) cover the entire apex of the cone; spiracles may be divided into half, each half has a round button with eight straight slips radiating from this button. For details see drawing.

Length 5 mm., width 3 mm., height 2.5 mm.

Pupa the same as the larva with the following differences: pale luteous yellow. A pair of anterior spiracles (fig. 1a) developed just above the lateral edge; spiracles are widely separated, the space equal to twice the length of one spiracle; they are reddish in color; the surface at the base has a microscopical checkered appearance; apical half has numerous, small, round tubercles scattered over the surface. For details see drawing.

Larva and *Pupa* with small black ants (*Monomorium minutum* Buckley) under bark and in decayed sapwood of a log of chestnut-oak.

Collected at Difficult Run, (Arlington County), Virginia, July 4, 1916, T. E. Snyder, collector.

Hopkins U. S. No. 12994a.

Twelve adults emerged from July 10-12, 1916.

Note. The drawing is that of the *larva*. The *pupa* is the same in appearance with the addition of anterior spiracles which are located in their natural position on the *pupa* with dotted lines.

The details are shown in fig. 1.

Collected at Palm Grove, Texas. One adult emerged June 4, 1917, Hopkins No. 15120a.

Xylota pigra Fabricius.

(Plate 6, figs. 2c-f)

Pupa.—Large, nearly cylindrical, dull, light brownish yellow; larger towards the anterior end; entire surface covered with a fine, short pubescence; surface with numerous, narrow, transverse wrinkles; there are numerous hair-like appendages along the lateral edges and on the dorsum; each appendage is composed of three hair-like filaments; at the extreme apex, on the under, lateral edge is a group of short, reddish spines; on each side of the apex, widely separated, is a dark reddish chitinous plate, which is somewhat rounded in outline; each plate has two large dark red, horn-like prongs (fig. 2c); the inner one is turned slightly upward; the other one is much larger and points outward. Anterior spiracles (fig. 2d) are cylindrical, tuberculate with their height about equal to the diameter; they are deep yellowish in color; the outside is cut off obliquely; this oblique surface is flat, shining and with the inner edges dark brownish; the central area is elliptical, pale yellow, which color reaches the outer edge; the upper or inner edge of this yellow area radiates into nine long

points or rays; about the apical fourth or fifth, on the dorsum, are located a pair of spiracles of deep luteous yellow (fig. 2e); they are separated by a distance equal to twice the length of one spiracle; each spiracle is nearly cylindrical; basal half is coarsely granular; upper half has numerous prominent tubercles which are somewhat arranged in pairs. On each side of the caudal end are three cylindrical, pointed appendages with numerous hair-like filaments; each appendage is about three times as long as its basal diameter. At the center of caudal end is an elliptical semi-transparent, reddish-brown, chitinous, shining, tail-like projection; variable in length because it is partly retractile; nearly the basal half is smooth; apical end is roughly granular; apical surface is flat, resembling the figure 8; dark brown to blackish along the edges; inner surface more reddish brown; each half (fig. f) has four sinuous slits which have numerous small branches on each side; also a button which has two, small, dark areas or faint depressions.

Length 7 mm.; diameter 3 mm. at apical fourth; tail 1 mm. long, 5 mm. wide.

Hopkins U. S. No. 11907 a.

Collected at Larkspur, Colorado by A. B. Champlain. Under bark of *Pinus ponderosa*.

Adults emerged from the Pupa February 9 to March 5, 1914.

Under Hopkins U. S. No. 12932 there were 12 larvae of this species from the same locality collected August 21, 1914. On September 22, 1914, 12 adults emerged.

***Chrysotoxum pubescens* Loew.**

(Plate 6, figs. 3k-l. Pupa only drawn.)

Larva opaque white, segmentation irregular, with numerous transverse wrinkles; cephalic end tapers very slightly; mouth parts retractile; posterior spiracles in the center of the caudal end which projects .5 mm.; this projection is heavily chitinized, very dark reddish, nearly black; with a longitudinal groove in the middle of the dorsal and ventral surfaces. Venter has seven pairs of ampullae which are evenly spaced.

Larva at rest is 11 mm. long and 5 mm. wide, nearly cylindrical.

Found under a stone in a moist place.

A. B. Champlain, collector.

Larva pupated May 3, 1917. Later on the same date the puparium was a pale, dull yellowish white.

May 28, 1917, an adult male emerged.

Hopkins U. S. No. 14803.

Pupa pale, dull, luteous yellow with the surface microscopically transversely rugose; the puparium is cylindrical, rather blunt on cephalic end, gradually tapering down to the caudal end which is transversely rugose (remains of the larval segmentation and partly caused by shrinkage fig. k); venter faintly transversely, concave in the center. No anterior spiracles. Posterior spiracles project slightly, the width is equal to the length and the height about half the width; color is dark brown, sub-shining; above and below is a faint groove

dividing this projection longitudinally in half; on the apex are located the spiracular slits; each half has the following: (right half drawn fig. 1) at the upper inner corner is an elevation with a circular depression in the center which appears like a tube; radiating from this depression are three rounded, sinuous, shining black ridges with a yellowish slit on the dorsum; the lower inner slit is perpendicular; between the ridges is a raised, finely granular surface with the inner end pointed. Anal opening small, transverse with a narrow area reddish brown.

Length 8 mm.; diameter 4 mm.; tail .75 mm. long.

***Brachypalpus rileyi* Williston.**

(Plate 6, figs. 4g-j)

Larva medium size, robust, nearly cylindrical, with the sides about parallel, dull, light brownish yellow; broad transverse wrinkles; entire surface of larva closely beset with short, fine pubescence; first segment nearly as long as broad; on apical edge are numerous short, robust spines; on each lateral edge are two faintly rounded elevations; each of the transverse segmental wrinkles are somewhat rounded on the lateral edge; there are numerous, small, tufts of hairs or hair-like projections arranged in longitudinal rows on the dorsum and the lateral edges; last three segments terminate laterally into a long conical projection, each with numerous dark brown spines; these projections increase in size towards the caudal end; the posterior projection is about two and one half times longer than the anterior one.

Length 9 mm.; diameter 3.5 mm.; posterior spiracles project 1 mm.

For other details see description of pupa.

Two larvae collected at Glen Echo, Maryland, October 23, 1921, J. C. Bridwell, collector.

Larvae under bark of hickory.

Pupa not so rugose as the larva; dull, dark reddish-brown with entire surface covered with a short microscopic pubescence and very narrow transverse rugosities; at the apex, on the lateral edge, are two small, nearly circular, reddish, chitinous plates (fig. h) each bearing two prongs; the inner one pointing up and back towards the dorsum and the other pointing out and backward; these plates are widely separated; just above these are the anterior spiracles (fig. g) which are elliptical, deep reddish, about as long as greatest diameter; at the apex they are cut off obliquely towards the outside; this surface is smooth, dark along the edge, with a lighter, yellowish area in the center reaching to the outer edge; this light area has seven finger-like areas radiating toward the inner edge; back of the anterior spiracles is another pair of spiracles (fig. i) which are widely separated, the space is about two and one-half times the diameter of one spiracle at the base; these spiracles are reddish-black, cone-shaped, leaning slightly outward and backward; their height is only slightly more than the diameter at the base; there are numerous tubercles on the surface; each tubercle is nearly round with a faint depression in the center; around the base of the spiracles the surface is faintly raised and forms like a blackish ring. Posterior spiracles are heavily chitinized, deep reddish-yellow; the base is slightly larger in diameter for a

distance equal to about half the diameter; the remainder is slightly smaller in diameter and about one and one-half times longer than broad; along the center is a vertical groove reaching to the apex; apex shining, brownish-black; in outline crudely shaped like the figure 8; on each half near the inner edge is a large circular depression which has a depression in the middle; on the outer edge are two small tubercles, the lower one is about on the horizontal center line; each half (fig. j) has four reddish-yellow sinuous slits.

Length 9 mm., diameter 4.25 mm. Posterior spiracles project 1 mm.

Hopkins No. 12980.

Two pupae collected at Dead Run, Arlington County, Virginia, March 24, 1916, C. T. Greene collector. March 26, 1916, two adults emerged.

Pupae were found in a crevice of a cedar stump.

***Xylota bicolor* Loew.**

(Plate 7, figs. 1a-d)

Puparium cylindrical, dull, deep luteous yellow with a brownish tinge; surface covered with a microscopical, yellow pubescence; cephalic end has a broad rounded point; the greatest diameter at the apical fourth and from here the body tapers gradually to the caudal end; which is somewhat extended and slightly longer than its diameter; on each side is a short rounded tubercle and above each, at the apical edge is a longer, slender, cylindrical tubercle. Protruding from this extension or tail is a heavily chitinized elliptical, shining rod (which is retractile and therefore varies in length) semi-transparent, pale yellow and broadly reddish-brown at the apex. Posterior spiracles are located on the apex of this rod; the right half is drawn, (fig. 1d) each half contains a round depression and three sinuous slits of a pale yellow color. At the cephalic end are numerous short spines along the edge; back of these spines and slightly above the lateral edge, on each side, is a pair of reddish chitinous hooks fused at their base (fig. a) the larger or inner one curves backward, the outer one curves out and backward. A short distance in back of these hooks, on the dorsum, are located the anterior spiracles (fig. b); these are yellowish-brown, shining, heavily chitinized, elliptical and about as long as the greatest diameter; the upper, outer surface is cut off obliquely; on this oblique surface is a pale yellow area which has six finger-like radiating areas; this yellow area reaches to the outer edge and down along the outside surface of the spiracle. Quite some distance in back of the anterior pair, at about the apical fourth of the puparium and widely separated is another pair of spiracles which are widely separated at the base; each spiracle (fig. c) is heavily chitinized, three times longer than wide, with a granular surface, shining, reddish-yellow in color; each directed obliquely outward and curved backward; there are numerous, distinct, round tubercles on the upper three-fourths and a long, narrow bare area on the inner front surface.

Length 12 mm.; diameter 4 mm.

Hopkins No. 12988a.

Collected at Falls Church, Va., May 5, 1916, by C. T. Greene. Adult emerged May 17, 1916.

Pupae were found in frass in a pocket of an old tree of *Liriodendron tulipifera*.

***Criorhina pictipes* Bigot.**

(Plate 7, figs. 2e-g)

Pupa, small, dull, luteous yellow; nearly cylindrical, slightly flattened on ventral surface which is covered with short, fine yellow hairs; on the ventral surface are evenly paired clusters of bristly hairs which are the remains of the larval ampullae; diameter of puparium nearly one-third the length of the body; puparium tapers slightly towards the cephalic end and is somewhat wedge-shaped transversely with the anterior edge faintly indented; along this edge is a row of short hairs; the tail is about two-thirds the length of the body, cylindrical, tapering towards the apex which is about one-fourth the diameter of the base. Anterior spiracles short, cylindrical, pale yellowish, microscopically rugose; apex cut off obliquely towards the outside and nearly semi-circular in shape; this upper surface is smooth, shining, with the central area lighter in color and indented along the edge (fig. e). At about the apical fourth, on the dorsum, is located a pair of spiracles (fig. f) widely separated, the distance between them is about two and one-half times the length of one spiracle; these spiracles are of a more golden yellow than the puparium, directed slightly backward and outward and have numerous small, rounded tubercles distributed on the entire surface.

The tip of the tail is somewhat rectangular in shape with the spiracular tube slightly protruding and rectangular in form (fig. g); this inner tube is yellowish-white in color, semi-transparent with a thin wall, perpendicular in the center.

Length 7 mm., diameter 2.75 mm.; tail 3.5 mm. long; 5 mm. diameter at base.

One adult female emerged April 22, 1919.

Pupa collected in frass in a dead tulip stump at Falls Church, Va., April 19, 1919, C. T. Greene, collector.

***Myiolepta nigra* Loew.**

(Plate 7, figs. 3, k).

Puparium.—Medium size, dull, brownish-yellow; covered with short pale yellow hairs; puparium nearly cylindrical, slightly flattened on the ventral surface; greatest diameter at about the apical fourth, tapering gradually towards the caudal end, terminating into a small tail-like projection which is only slightly longer than wide; from this projection is extended a very slender, heavily chitinized, dark reddish, semi-transparent, elliptical rod. This rod is variable in length because it is retractile. At the apex are located the posterior spiracles (fig. k); the central area is light yellowish and very faintly depressed with two elliptical areas which are slightly oblique to each other; these areas are outlined with microscopical bead-like markings; the outer edge is a dark reddish-brown with a black winding line on the surface which has the appearance of a narrow edge.

Length 7 mm.; diameter 3.5 mm.; tail 1 mm. long; width 1 mm.

Hopkins Nos. 12977*i* and 12988.

Puparium found in a hole in a tulip tree *Liriodendron tulipifera*. Two adults emerged May 11-22, 1916. C. T. Greene, collector,

***Blera* (Criorhina) *umbratilis* Williston.**

(Plate 7--figs. 4h-j).

Puparium. -Medium sized, cylindrical, dull, luteous yellow, microscopically pubescent and with a tail about half the length the body. Cephalic end tapers to a broad rounded point with a short row of short hairs on the edge; greatest diameter at apical third; the diameter gradually diminishing towards the caudal end; tail is four or five times longer than basal diameter; apical diameter is about half that of the base. Posterior spiracles are located on the apex of a heavily chitinized, dark brown to black, hollow rod which contains the tracheae; this rod is retractile; the left half of the apex of this is drawn (fig. j), the dark edge is nearly black and shining; the light portion is pale luteous yellow with two large, pointed lobes and two rounded lobes, the larger one at the top. Anterior spiracles (fig. h) close to the apex, widely separated by a broad, low ridge tapering towards the apex; each spiracle is nearly cylindrical, dark reddish, chitinized and cut off obliquely towards the outside; this oblique surface is elliptical in form, smooth, sub-shining with a pale yellowish area in the middle; this yellow area has one broad projection below to the left, and eight, narrow, finger-like projections above; around the base of these spiracles is an area with a granular surface. Further back, near the greatest diameter is another pair of spiracles (fig. i) separated by a space equal to the length of one spiracle; they are directed outward and curved backward; each has a slightly darkened area around the base; each spiracle is pale, luteous yellow, with four transverse rows of paired tubercles widely separated on the inner front surface; apex with numerous rounded tubercles; at the base of these spiracles are numerous short hairs which are easily broken off.

Length 7 mm.; diameter 3.75 mm.; tail 2.25 mm. long, .5 mm. diameter at base.

Two pupae collected at Great Falls, Va., April 21, 1916, in moist frass in a hole in an old Sycamore tree. C. T. Greene, collector.

Hopkins No. 12984.

Adults emerged May 3, 1916.

EXPLANATION OF PLATES.

Plate 6.

Fig. 1—*Microdon coarctatus* Loew.

Larva, dorsal view.

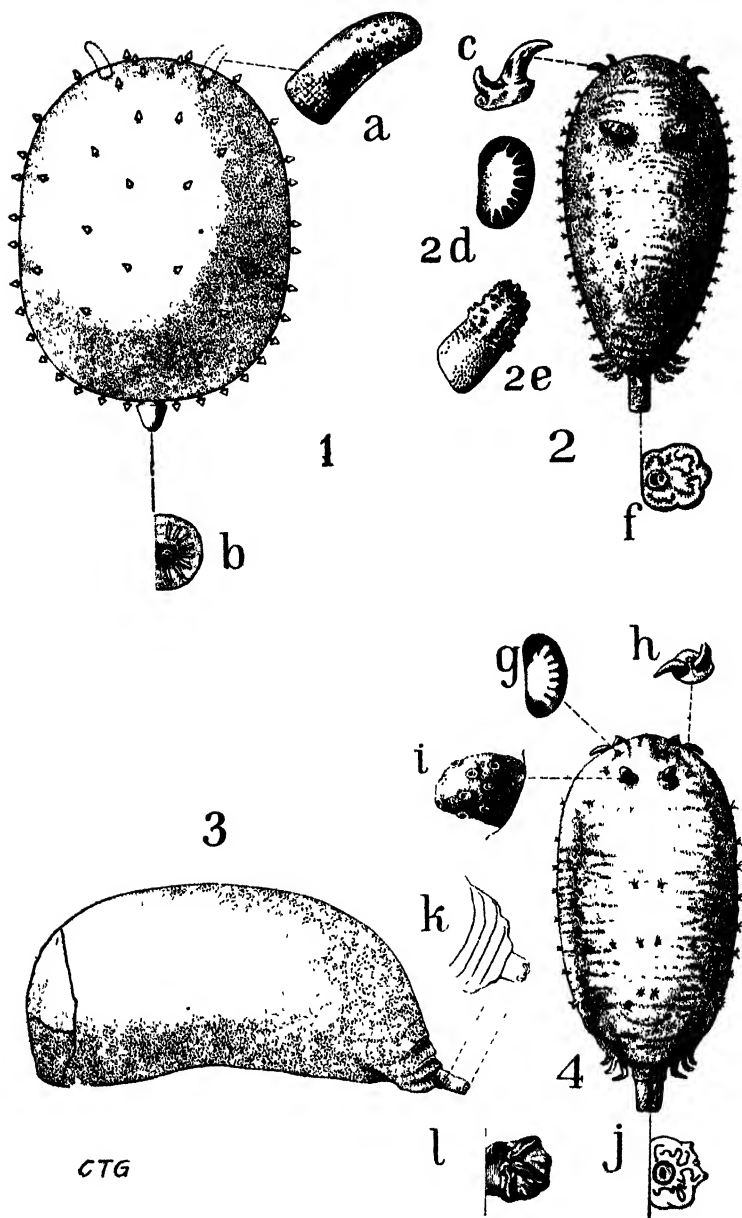
Pupa, same with the addition of fig. a.

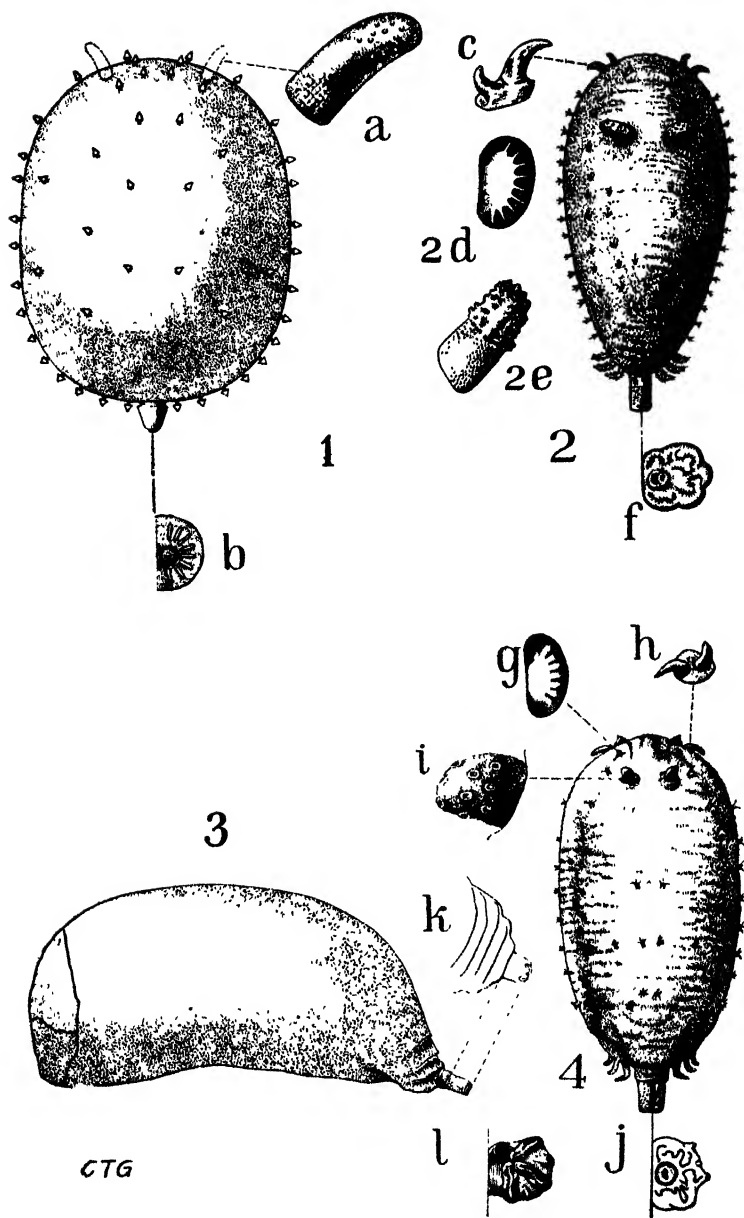
a—Anterior spiracle of pupa. Lateral view.

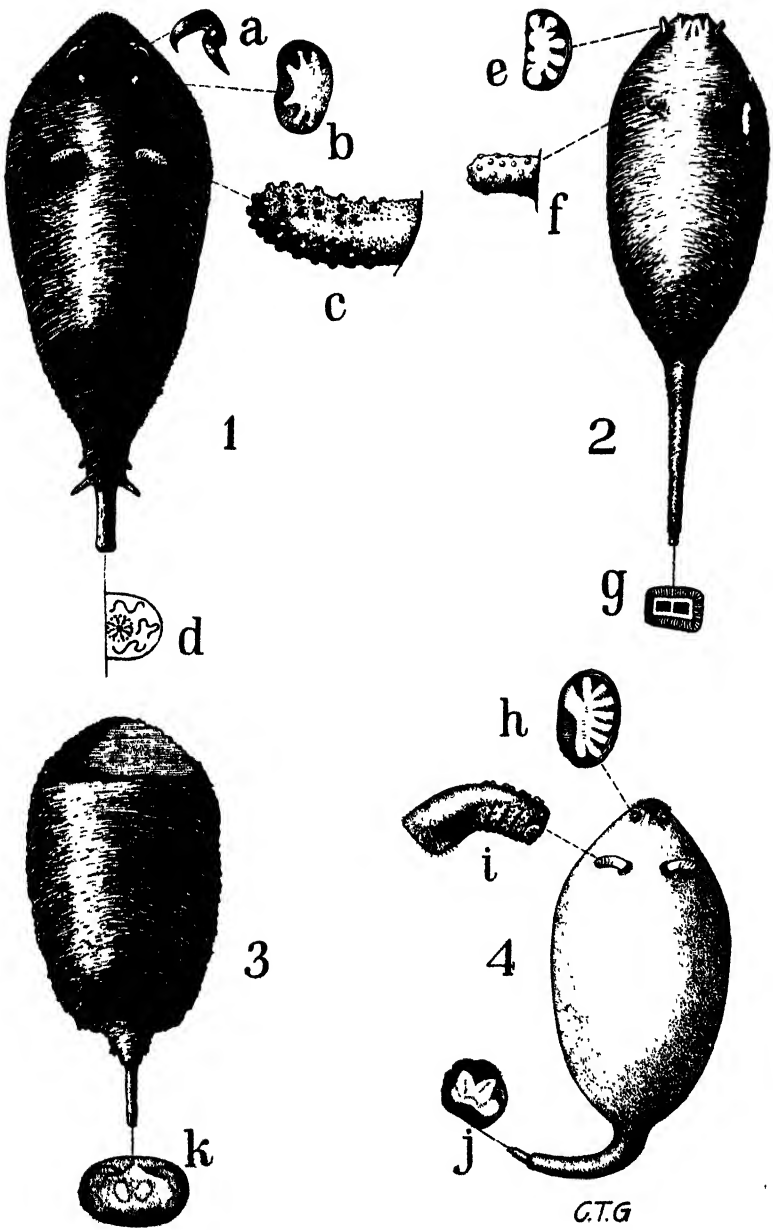
b—Posterior spiracle. Right half drawn.

Fig. 2—*Xylota pigra* Fabricius.

Pupa dorsal view.







In habits they are similar to species of *Cryptotermes* Banks, living in dry, hard, solid wood. These termites might easily be imported through commerce (in furniture, etc.) and might prove very destructive. They probably could survive in the Southern States. Their presence in wood may be detected by small round holes and small impressed pellets of excreta which drop from the wood.

***Glyptotermes corniceps*, new species.**

Deilated adult.—Head yellow-brown (light castaneous-brown) lighter towards posterior margin, where rounded, slightly longer than broad, on anterior slope, V-shaped, white markings originating from a fairly large, oblong frontal gland depression, which has its base on a line with the center of the ocelli; with scattered, long hairs.

Labrum yellow-brown, broader than long, broadly rounded at apex, with long hairs.

Eyes black, not round, large, close to lateral margin of head. Ocelli large, oblong, placed obliquely but close to compound eyes.

Antennae light yellow-brown, 9 segments (broken), pubescent; third segment slightly darker colored, subclavate, longer than second or fourth segments; fourth to seventh small, ring-like to wedge-shaped; from seventh on, segments longer and broader.

Palpi light yellow-brown, terminal segments conical, middle segments broad, pubescent.

Pronotum light yellow-brown, darker on margins, margins emarginate only slightly anteriorly, not twice as broad as long, sides nearly parallel, rounded near posterior, with long hairs.

Legs with femora white and swollen, tibiae and tarsi yellow-brown, slender, pubescent.

Abdomen light yellow-brown, densely pubescent—hairs fairly long.

Measurements:

Length of entire deilated adult: 4.70-5.00 mm.

Length of head (to tip labrum): 1.30 mm.

Length of pronotum: 0.80 mm.

Length of wing scale: 0.90 mm.

Length of hind tibia: 0.95-1.00 mm.

Diameter of eye (long diam.): 0.31 mm.

Width of head: 1.10 mm.

Width of pronotum: 1.10 mm.

Soldier.—(Plate 8, figs. 1-3). Head light yellow-brown, darker (light castaneous-brown) anteriorly, slightly concave in profile and with sides slightly convex, rounded posteriorly; depression at anterior slope (epicranial suture) which is outlined by a slightly raised rim; one short, slender, castaneous-brown knob or forward-pointing lateral process between antennal socket and maxillary palpus; faint oblong eye spot parallel to rim of antennal socket; head with scattered, fairly long hairs.

Labrum light yellow-brown, broader than long; broadly rounded at apex where there are long hairs.

Gula fairly broad, width at middle more than half the width at front.

Mandibles reddish-brown to piceous—lighter colored near base; elongate, fairly straight, incurved at tips, slightly curved upwards; marginal teeth prominent near tip of left mandible.

Antennae light yellow-brown, 11-12 segments, pubescent; third segment subclavate, slightly longer than second or fourth; from fifth segment on segments longer and broader; last segment short and suboval.

Maxillary palpi with the terminal segment slender, elongate (longer and more slender than the two adjacent segments), with apex obliquely truncate, pubescent.

Pronotum white with tinge of yellow, darker colored at anterior margin, where deeply but roundly emarginate, somewhat semicircular, posteriorly emarginate.

Legs with femora white and slightly swollen, tibiae and tarsi yellowish and slender, pubescent.

Abdomen dirty white with tinge of yellow, with dense, fairly long hairs.

Measurements:

Length of entire soldier: 3.7-3.8 mm.

Length of head with mandibles: 2.20-2.45 mm.

Length of head without mandibles (to anterior): 1.45-1.50 mm.

Length of left mandible: 1.00 mm.

Length of pronotum: 0.50-0.65 mm.

Length of hind tibia: 0.70-0.75 mm.

Width of head: 1.05-1.15 mm.

Width of pronotum: 0.9-1.05 mm.

The specific name is based on the processes on the front of the head of the soldier.

Type locality.—Boqueron-Salinas, Porto Rico.

Described from two deälated (♂ and ♀) adults and two soldiers, collected together with workers at the type locality on February 21, 1923, by G. N. Wolcott, Acc. No. 81-23.

Type, male deälated adult.—Cat. No. 26199, U. S. N. M.

Biological Note.

The manner of working in dry hard wood is similar to that of *Glyptotermes pubescens* Snyder of Porto Rico. Similar impressed pellets are expelled from tunnels in the infested wood—in this case a dead tree branch. The locality where collected is one of the driest sections of the island and about one mile away salt was being made by open-air evaporation of the sea-water.

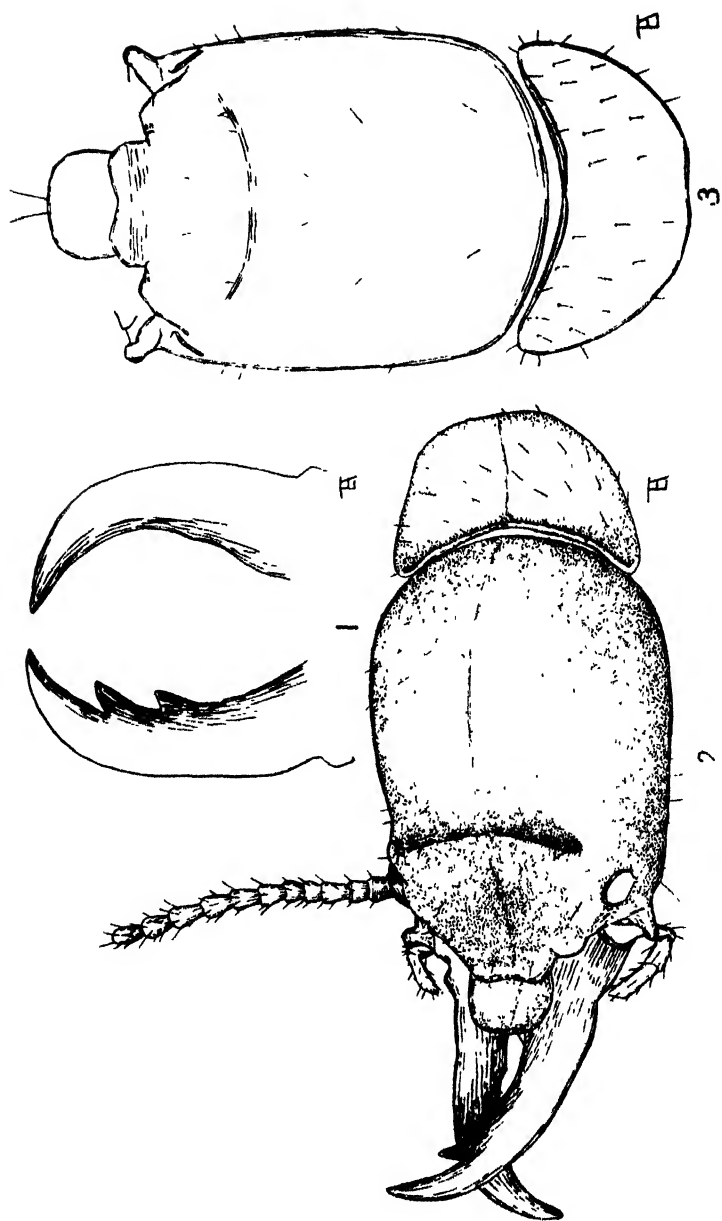
Explanation of Plate.

Plate 8. *Glyptotermes corniceps* Snyder. Soldier.

Fig. 1. View of mandibles, dorsal.

Fig. 2. Three-quarters view of head and pronotum.

Fig. 3. Dorsal view of head and pronotum (outline), note anterior knobs.



SNYDER—GLYPTOTERMES CORNICEPS.

A NEW PARASITIC FLY BRED FROM THE BEAN BEETLE.

By J. M. ALDRICH, *United States National Museum.*

The new species of fly herein described was reared in large numbers (some nine hundred) by E. G. Smyth from larvae of the bean beetle, *Epilachna corrupta* Muls. in late summer and fall of 1922. The beetle larvae were collected at Coapa, D. F., Mexico. Efforts have been made to introduce the fly into the region of Birmingham, Alabama, where the beetle has been introduced in the course of its recent spread through the Southern States.

***Paradexodes epilachnae*, new species.**

Male.—Head, thorax, abdomen and legs entirely black in ground color, the halteres and calypters yellow. Eyes bare; front .188 of head width (average of three, —.184, .189, and .191); outer vertical indistinguishable, ocellars present, orbitals absent, frontals in a single row each side, three or four upper ones reclinate, lowest as far down as arista; parafrontals and parafacials narrow, brown near vertex, gradually more cinereous below but not silvery, the parafacials bare; antennae black, third joint slender, hardly three times the second, reaching nearly to the vibrissae, which are at the oral margin and not much approximated; facial ridges with only a few small bristles close to the vibrissae; bucca one-fifth the eye-height; palpi black, ordinary, proboscis small.

Thorax with four black stripes anteriorly when viewed from behind, the posterior half or more shining black in most lights; three posterior dorsocentrals; sternopleurals two anterior, one posterior; anterior acrostichals three pairs, the hindmost close to suture; scutellum with a pair of long divergent apicals directed backward and two lateral pairs, with a small subdiscal pair near tip.

Abdomen conical and rather slender, with well-developed discs on segments two, three and four; median marginals also on the first; shining black in most lights except on the bases of the segments, but in other lights a thin white pruinosity extends broadly along the sides. Genital segments small, black, the second with numerous hairs directed backward; outer forceps brown, broad, curved toward tip, as long as the inner, which are black, slender, nearly straight and close together; penis short and blunt; claspers minute; fifth sternite deeply cleft, without special modifications.

Legs black, all claws and pulvilli moderately elongated; middle tibia with a bristle on outer front side, hind tibia on outer hind side with a few irregular and one long at middle, another of same length on inner hind side at middle.

Wing a little elongate, slightly infuscated toward costa; fourth vein curving obliquely and ending a little before the apex of the wing, the distance from the tip of the vein to the apex being slightly greater than the length of the anterior crossvein; third vein with two or three hairs at base.

Female.—Front .253 of head width (average of three, —.250, .256, and .257); the usual orbitals present; third antennal joint as in male; abdomen and wings somewhat shorter and broader; tip of abdomen with a short, blunt point protruding, about as in *Phorocera claripennis* Mcq. Calypters white.

Length of male, 5.5 to 6 mm.; of female, 5 to 5.5 mm.

Described from many specimens of both sexes, Coapa, Mexico, bred as above indicated.

Type.—Male, Cat. No. 26097, U. S. N. M.

It was at first anticipated that this species would be found among those described by Van der Wulp in his large work in *Biologia Centrali-Americana*. As experience has shown that these species are not recognizable with certainty from the descriptions, specimens were sent to the British Museum, where Van der Wulp's types are deposited; and Major E. E. Austen very kindly compared them with the types, coming to the conclusion that our species is different from all of them.

I refer the species to the genus *Paradexodes* after much examination of related forms. The type species of the genus is *aurifrons* Townsend, both genus and species having been described by him in *Smithsonian Miscellaneous Contributions*, No. 1803 (*Taxonomy of the Muscoidean Flies*), p. 101, 1908. The single male specimen there described as *aurifrons* is in the National Museum, and no additional material has been obtained. Townsend's later genus *Urodexodes* from Peru (*Proc. U. S. N. M.*, Vol. 56, p. 572, 1919, type *charapensis* in the same place) I would consider a synonym, as on comparing the two type specimens of the genotype species I see no differences that I can regard as generic; the differences mentioned in the description do not exist, save for a few of trifling importance. Absence of ocellars in *Urodexodes* is not generic, as other specimens collected at the same time and place and of barely subspecific difference have ocellars.

The genus *Ptilodegeeria* of Brauer and Bergenstamm (*Zweifl. Kais. Mus.*, v, 1891, 373, 375), with type *Hypostena obumbrata* Van der Wulp, (*Biologia, Dipt.*, ii, 143, 1890), is closely related, as shown by specimens of *obumbrata* from the type lot, which we have received from the British Museum. The latter species however has densely hairy eyes, and the discal bristles are poorly developed.

Epilachnae is somewhat more closely related to *charapensis* than to *aurifrons* or *obumbrata*.

NEW ACULEATE HYMENOPTERA FROM THE UNITED STATES.

BY S. A. ROHWER, U. S. Bureau of Entomology.

The species described below have been submitted for identification and the descriptions are presented at this time so the names will be available.

Nysson (*Brachystegus*) *hoplisivora*, new species.

Because the apical band on first tergite is yellow instead of

white, this species runs in Bradley's key¹ to *opulentus* var. *basilaris* Cresson better than it does to *opulentus opulentus* although the abdomen is almost completely black. It differs from both the typical form and the variety *basilaris* in the color of the legs, greatly reduced yellow band on the pronotum, the absence of yellow spot on the scutellum, the great reduction in the yellow markings of the abdomen, the more robust and less upturned spine on the propodeum, and the more strongly dentate anterior angle of the pronotum. *N. tuberculatus* of Handlirsch which Fox thought to be the same as *basalaris* may, according to the description, be distinguished from this new species by the pale marks on the scutellum, more extensive yellow markings on the abdomen and by the presence of pale marks on the hind tibiae and tarsi. In both Fox's and Cresson's keys the species runs to *mellipes* Cresson, but the color, sculpture of the tergites and dentation of the pronotum readily separate it from Cresson's species. The punctuation of the head, mesepisternum, sculpture of the propodeum and abdomen readily separate it from the description of the male of *submellipes* Viereck.

Female.—Length 7 mm. Clypeus convex, very finely granular and with a few small scattered punctures in addition, the anterior margin rounded; frons with close, small, well defined punctures and in addition with separated, distinct, large punctures; no raised line from anterior ocellus; no tubercle between antennae; between the posterior ocelli there are two shining, elongate, prominent tubercles; vertex and occiput sculptured like the frons except the smaller punctures are more widely separated and the large ones are closer together; antenna stout, third joint one-fifth longer than fourth, terminal joint obtuse and a little shorter than the two proceeding; lateral anterior angles of pronotum with a well defined, broad, acute tooth; scutum bipunctate, the large punctures close and in a few places confluent; scutellum margined laterally, shining, more coarsely punctured than the scutum and with many of the punctures confluent; metanotum medianly with a few large punctures; propodeum subshining with an irregular carina separating the dorsal and posterior surfaces, the dorsal aspect has about ten longitudinal rugae, the median ones being more pronounced; the posterior face irregularly reticulate with an irregularly-shaped transverse area at the top, the lower portion of the posterior aspect with four carinae which diverge dorsally; propodeal spine stout, directed posteriorly; mesepisternum sculptured like the scutum; sides of the propodeum shining, with fine, separated, setigerous punctures; abdomen shining with distinct, well defined punctures which are a trifle larger on the first tergite; second sternite convex, obliquely truncate anteriorly and sculptured like the tergites; pygidium about one-half longer than the posterior width, the surface coarsely, striato-punctate; venation normal. Black; small median spot on the anterior margin of the pronotum, narrowly interrupted band on the first tergite and two small lateral spots on the apical margin of the second tergite yellow; first tergite, except obscure, reddish,

¹Trans. Amer. Ent. Soc., vol. 46, 1920, p. 122.

lateral spots and the apical yellow band, black; legs black; anterior femur and tibia beneath obscurely reddish, the intermediate femur apically and entire posterior femur dark rufous; body covered with silvery pile which is denser on the clypeus, face, sides of frons and lateral dorsal aspect of propodeum; wings subhyaline, slightly darker along anterior margin; venation black.

In one of the paratypes the anterior femora are almost entirely rufous and the anterior tibiae are rufous at base.

Type-locality.—Woodstock, Maryland.

Described from three females received from F. G. Reinhard, S. J., collected in the summer of 1922, the type bearing the label "Parasite in nest *Hoplisis costalis*."

Type and paratype.—Cat. No. 25645, U. S. N. M. One paratype returned to the collector.

***Didineis stevensi*, new species.**

This new species resembles *D. peculiaris* Fox but can readily be distinguished from Fox's species by the black head.

Female.—Length 7.5 mm. Clypeus convex clothed with long hair, the apical margin depressed and with three obtusely rounded teeth; frons coriaceous-reticulate; vertex and orbits shining, with separate punctures; postocellar line subequal with ocellular line; third antennal joint distinctly shorter than the fourth and fifth; mesoscutum with close, distinct punctures; scutellum shining, more sparsely punctured; dorsal aspect of propodeum with a distinct triangular-shaped area which is coarsely and irregularly wrinkled, the area immediately outside the enclosure with short oblique striae; posterior aspect of propodeum granular and with irregular dorsad-ventrad wrinkles; abdomen shining, the third and following segments finely punctured. Ferruginous; mesosternum, head (except clypeus, mandibles and narrow inner orbits below which are yellowish) and apical ten joints of antennae black; rather sparsely clothed with silvery pile, the apical margins of tergites with a silvery hair band, that on the first broadly interrupted; wings subhyaline, the radial, second cubital and apical part of second discoidal cells with a fuscous cloud; venation brown.

Type-locality.—Sheldon, North Dakota.

Described from a single female collected August 10, 1919, by O. A. Stevens and given his number 12289. Named for the collector.

Type.—Cat. No. 24613, U. S. N. M.

***Tachysphex dakotensis*, new species.**

This species seems to be closely allied with *T. sepulchralis* Williams but may be distinguished from the description of Williams' species by the sparsely punctured frons, the punctures of the scutum not being compact, the pygidium not being finely reticulate and the abdomen without distinct fasciae. From *T. bruesi* Rohwer it may be distinguished by the sparsely punctured frons and scutum and the longer fourth abscissa of the radius. The sparsely punctured vertex and abundant hair

on the thorax will serve to distinguish it from *T. nigrior* Fox. *T. punctifrons* Fox has darker wings, is larger and has the scutum closely punctured.

Female.—Length 8 mm. Clypeus convex, the basal half with distinct rather close punctures the apical half polished, the apical margin rather narrowly depressed, broadly produced medianly, the lateral angles of projection sharp but not dentate, the middle of the projection *slightly* rounded out; frons with distinct, rather close punctures on a granular surface; vertex shining, with distinct well separated punctures; dorsal interocular space greater than antennal joints three plus four but less than two plus three (ratio: interocular space 10, three plus four 13, two plus three 8.5); mesoscutum shining, with distinct well separated punctures (closer above and behind tegulae); scutellum shining, not impressed; dorsal aspect of propodeum coriaceous, with a few raised lines at base; posterior aspect of propodeum transversely rugose, separated from the dorsal aspect by a more or less distinct carina; mesepisternum with distinct, separated punctures on a granular surface; sides of the propodeum with distinct striae; legs rather feebly spined; longer spur of hind tibia shorter than basi tarsus; fourth abscissa of radius distinctly longer than second which is longer than third; abdomen shining; pygidium more than twice as long as basal width, shining, with a few large punctures. Black; rather densely clothed with silvery hair and pile; abdomen with distinct fasciae of silvery pile; wings hyaline, venation dark brown.

Type locality.—Gascoyne, North Dakota.

Described from a single female collected June 19, 1918, at flowers of *Malvastrum coccineum* by O. A. Stevens and recorded under his number 11373.

Type.—Cat. No. 24557 U. S. N. M.

***Epicrossocerus rauli*, new species.**

Evidently closely allied to (*Crabro*) *Epicrossocerus insolens* (Fox) but differs from the original description in having a distinct impressed line from the anterior ocellus.

Female.—Length 3 mm. Antenna short, thickening apically, third joint nearly twice as long as the fourth; head shining, under high magnification finely reticulate; a narrow impressed line in front of anterior ocellus; postocellar and ocellular lines subequal in length; anterior lateral angle of pronotum angulate but not strongly dentate, the carina somewhat emarginate medianly; scutellum and scutum finely, closely punctured; propodeum finely punctate-reticulate, lateral carinae of the posterior face feeble, median depression spear-shaped; mesepisternum and sides of propodeum reticulate; abdomen impunctate, shining; pygidium fully twice as long as basal width, narrowed and channeled apically. Black; mandibles except apices and all tarsi whitish; tibiae brownish, at base and apex; scape beneath yellowish; wings hyaline, venation black.

Type-locality.—St. Louis, Missouri.

Type.—Cat. No. 24593 U. S. N. M.

Described from five females (one type) collected by Phil Rau and under his number 4125. Named for the collector.

Stigmus fraternus subspecies **raui**, new subspecies.

Closely allied to *coloradensis* Rohwer but the scutum is entirely smooth and polished (not with indistinct granulations); the recurrent is the length of the first intercubitus or less from the end of the cell; and the second flagellar joint is subequal with the first (not slightly shorter).

Type-locality.—St. Louis, Missouri.

Type.—Cat. No. 24592 U. S. N. M.

Described from six females (one type) and one male (allotype) under Rau number 4052. Material collected May, 1920, by Phil Rau for whom the subspecies is named.

Nitela virginensis, new species.

This species, which is the first from the Nearctic region, differs from the European *spinolae* Latreille as determined by Lichtenstein in the stronger carina on the anterior margin of the pronotum; the shorter first cubital cell—the first abscissa of the radius is one-third the length of the second (not about one-half); and in the front being shiny and punctate, rather than opaque and coriaceous.

Female.—Length 3.5 mm. Clypeus with a distinct median carina; the anterior margin truncate; the surface finely coriaceous; frons subshining, with sparse, fine, setigerous punctures; an indistinct, impressed line from the anterior ocellus between the bases of the antennae; postocellar line twice as long as the interocellar line; antenna stout, the third and fourth joints subequal; the anterior margin of the pronotum sharply carinate, subdentate laterally but the carina narrowly interrupted medianly; mesoscutum finely coriaceous, irregularly wrinkly immediately in front of the scutellum; scutellum subshining with small, separated punctures; dorsal surface of the propodeum coriaceous and with strong, irregular rugae, the two median ones diverging and reaching the posterior aspect; mesepisternum subshining; the episternauli and suture below tegula deeply impressed; sides of the propodeum coriaceous and with irregular wrinkles; posterior face of propodeum transversely rugulose; abdomen shining, impunctate; first cubital cell short, not exceeding discoidal cell; first abscissa of brachius obsolete. Black; face with sparse, silvery pubescence; wings hyaline; costa and stigma brown, the rest of the venation testaceous.

Type-locality.—Chain Bridge, Virginia.

Described from a single female collected September 18, 1921, by J. R. Malloch.

Type.—Cat. No. 25846, U. S. N. M.

Anthophora (Anthemoëssa) rauli, new species.

The following new species is closely allied to *sodalis* Cresson and I had so determined it for Phil Rau, but on comparison with Cresson's type it was seen to differ in the characters given in couplet nine of the following key.

Female.—Length 16 mm. Labrum with large, close punctures; clypeus dull and covered with close (sometimes confluent) punctures; eyes separated by a distance subequal to their length; third antennal joint but little shorter than the three following; first recurrent received a short distance beyond middle of second cubital cell; abdomen opaque, finely granular. Black, clothed with long black hair except as follows: area at bases of antennae and the occiput with pale hair intermixed with the black; thorax and propodeum dorsally, upper half of mesepisternum, first tergite and a median patch on the second tergite with long, dense yellowish-white hair; wings fuliginous, venation black.

In the two paratype females the vertex also has pale hair intermixed with the black.

Male.—Length 12 mm. Labrum with large punctures; scutellum with distinct punctures which are well separated; third antennal joint subequal with the two following; distance between the eyes slightly less than the length of an eye; first recurrent at middle of second cubital; tooth on hind basitarsus large, blunt, slightly before middle; abdomen opaque, finely tessellate; apical plate sub squarely emarginate. Black; labrum except lateral spots, clypeus, line above and triangular spots at sides, spot on scape beneath yellow; head, thorax, first two tergites and anterior legs with dense pale hair, that on the dorsal parts ferruginous the hair becomes paler to venter so that on front legs and sternum it is yellowish-white; hair of hind legs, sternites and tergites beyond the second black; wings fuliginous, venation black.

The paratype male differs in having the hair on dorsal parts yellowish instead of ferruginous.

Type-locality.—St. Louis, Missouri.

Described from three (one type) females and one male (allotype) received from Phil Rau and under his numbers 4161 (type) 4450, 4448 and 4449 (allotype); and from one male from Colorado under Baker No. 1232. Named for Phil Rau. One female paratype (Rau No. 4448) lacks the abdomen.

Type.—Cat. No. 25588 U. S. N. M.

Key to certain Nearctic species of Anthemoëssa.

1. Scutellum (at least) with black hair 2.
— Scutellum with pale hair; in one case a patch of black hair on scutum but otherwise hair of thorax all pale 3.
2. Abdomen clothed with pale hair which is closer on the first three tergites; sides of propodeum with pale hair; female *solitaria* Ritsema.
— First two tergites of male and only second of female with pale hair; sides of propodeum with pale hair in male, entirely black in female
stanfordiana Cockerell.
3. Hair of abdomen pale; tooth on basitarsus at middle 4.
— Hair on at least some of the tergites black 5.
4. Length about 10 mm.; hair on abdomen sparse and erect; hair white
gohrmanae Cockerell.
— Length about 14 mm.; hair on abdomen dense and subappressed; hair fulvous *occidentalis* Cresson.
5. Hair of abdomen all black or with a few pale hairs on first tergite
abrupta Say.

- At least the first two tergites with pale hair 6.
- 6. First three tergites completely clothed with dense pale hair
neomexicana Cockerell.
- Hair of third tergite largely or entirely black 7.
- 7. Scutum with a patch of black hair 8.
- Scutum entirely covered with pale hair 9.
- 8. Head above the antennae with black hair; pubescence of abdomen yellowish *canadensis* Cresson.
- Vertex with some pale hair; pubescence of abdomen whitish
bomboides Wm. Kirby.
- 9. Femora with white hair (hind femora with black hair posteriorly); apical sternites with long white hair; emargination of apical plate U-shaped; base of third tergite with fulvous hair *sodalis* Cresson.
- Hair of four hind femora, sternites and tergite beyond the second all black; emargination of apical plate broad and subquadrate
raui, new species.

Anthophora (Anthemoëssa) bomboides (Wm. Kirby).

In the above key I have followed Cresson's interpretation of this species but I am not sure that it is correct. The original description makes no mention of the patch of dark hair on the scutum. It will be necessary to study Kirby's type and if such a study proves that Cresson's determination is correct it seems likely that *canadensis* should be placed as a synonym of *bomboides*. The characters used in the above key to distinguish these two forms will undoubtedly be subject to such variation that they can not be used to distinguish even varieties.

Megachile cockerelli, new species.

This species, which has stood in the Museum Collection for many years, resembles much more closely certain species from Africa than any species from the neotropical or nearctic regions.

Female.—Length 20 mm. Robust; abdomen as long as head and thorax parallel-sided; mandibles robust, coarsely striato-punctate (except at the lateral base where they are finely punctate) broad apically and armed with four strong teeth; anterior margin of the clypeus deeply broadly emarginate, lobes of the emargination broad and rounded, medianly the emargination has a small rounded tooth as a projection of the indistinct ridge on the surface of the clypeus; surface of the clypeus convex with rather close well defined punctures; impressed line from anterior ocellus to between the bases of the antennae; front, vertex and posterior orbits shining with separated well defined punctures; inner orbits bounded by a strong carina; third antennal joint slightly longer than the fourth; thorax with close punctures; first recurrent bent at right angles a short distance before it joins the cubitus; third and fourth abscissae of cubitus subequal; first abscissa of radius two-thirds as long as second; legs robust; abdomen shining with sparse setigerous punctures. Black; densely covered with long, ferruginous hair which on the abdomen is closer on the apical margins of the tergites; scopa

concolorous with the rest of the pubescence; wings deep brown; venation dark brown.

Male.—Length 20 mm. Mandibles more elongate than in female and armed apically with three teeth; the distance between the inner and middle tooth much greater than the distance between the outer and inner tooth; anterior margin of the clypeus truncate with a small median tooth formed as a projection of the median ridge; surface of the clypeus with large close punctures; rest of head and thorax as in female; anterior tarsi cylindrical and besides the ordinary pubescence, covered exteriorly with a row of long hairs; coxae not spined; venation as in female; apical tergite with a reflex median projection which is deeply emarginate; laterally and beneath the apical tergite has two pairs of strong teeth, the median of which is much broader and longer; apical sternite armed with strong median spines. Color as in female.

In the series of specimens before me, there is very little variation. The females are almost uniformly the same size as the type; however one of the specimens is only 16 mm. long. In the males the color of the pubescence shows some slight variation, and in some of them it is not so distinctly ferruginous as in others.

Type-locality.—Meadow Valley, Mexico.

Described from twenty females (one type) and five males (one allotype) collected by C. H. T. Townsend.

Type, Allotype and Paratypes.—Cat. No. 14103, U. S. N. M.

This species was originally given the manuscript name *cockerelli* by F. S. G. Titus, and I take great pleasure in using this name and dedicating the species to Professor Cockerell in recognition of his work on bees and his great service to the collections of the National Museum.

REARING DIPTEROUS LARVAE ON NUTRIENT AGAR.

By R. C. SHANNON, *Bureau of Entomology*.

In the American Journal Tropical Medicine, Vol. II, 555, 1922, the writer gives an account of an attempt to rear Tabanid larvae on Bacto-Nutrient agar. Although some larvae remained alive for a period of over eight months in this medium it was evident that they would not thrive on the 3 per cent beef extract contained in the agar. Experiments were then undertaken to ascertain what concentration of food was necessary to make this medium sufficient for predaceous and carrion feeding larvae. Larvae of Sarcophagidae were chosen for this purpose for several reasons—the abundance of adults facilitated obtaining larvae; if successful, the larvae could be easily raised as food for Tabanids and other insects; and the rearing of species of this group would be preparatory to rearing the larvae of such parasitic forms as Wohlfartia and Chrysomyia when material of these comparatively rare forms (rare in central New York) could

be obtained. Larvae of *Sarcophaga cimbicis* Ins. and *sarracenioides* Ald. were successfully reared on a medium made up simply of the beef infusion from one pound of hamburger steak and 3 per cent agar and water added to make one liter. A small species of *Limosina* (Borboridae) gained entrance into some of the Petri dishes and passed two or three generations in the same dish.

I am indebted to Dr. R. W. Glaser and Dr. O. A. Johannsen for certain references relating to the rearing of diptera on agar media. Baumberger in an extensive paper, "A Nutritional Study of Insects" (Journ. Experimental Zoology, 1919), has shown in the case of several dipterous larvae, particularly those of *Drosophila*, that their important food is the yeast cells, and to a less extent molds and bacteria commonly found in decaying fruits, and which grow very luxuriantly on artificial media; it was found that sterile larvae on sterile media did not complete their development. Baumberger is of the opinion that all insect larvae which have hitherto been termed scavengers, coprophages, etc., might well be included under the term mycetophages. It was noted in the writer's experiments that extensive fungous growths at least did not interfere with the larvae. J. R. Eyre (Ent. News, 215, 1921) relates a method of rearing the onion maggot on onion and cabbage agar. Precautions were taken to render both the larvae and media sterile; however, Eyre does not state that his cultures remained sterile throughout the experiments.

Agar has well proven its efficacy as a basis for insect media and its use is bound to become more widespread.

Corrections.

A rather obvious error occurs in an article by the undersigned in the last number of these Proceedings. On page 60 a new species of Zoraptera is described and in the generic assignment the ordinal name Zoraptera is used instead of the generic name *Zorotypus*. The species should be, of course, *Zorotypus manni*.
—A. N. Caudell.

Dr. Thompson has objected to "the variety of generic names" appearing in the paper by W. R. and M. C. Thompson (Vol. 25, No. 2, pp. 32-41). The editor followed the only copy submitted but the result, in regard to generic names, is not entirely in accord with Dr. Thompson's original draft of the manuscript which was revised by specialists in this country. The generic name *Masicera* should appear throughout the paper and on the legends for the plates instead of the name *Ceromasia*.

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NEW OLETHREUTIDAE FROM EASTERN UNITED STATES
(LEPIDOPTERA).

BY CARL HEINRICH, *U. S. Bureau of Entomology.*

The following descriptions are offered in advance of a general revision of the subfamilies *Olethreutinae* and *Laspeyresinae* now in preparation. It is desirable to have names for use before the larger work can appear; hence the wholly verbal descriptions. Figures of genitalia, male and female, will be given in the revision.

Subfamily *Olethreutinae*.

Bactra maiorina, new species.

Palpus and head whitish ochreous. Thorax ochreous, paler and more whitish ochreous cephalad. Fore wing ochreous with a central, longitudinal, fuscous shade from base to apex; at end of cell a very small dot; costa faintly strigulated with fuscous; cilia pale ochreous dusted with fuscous, especially toward apex. Hind wing ochreous fuscous; cilia whitish ochreous with a dark basal band.

Alar expanse.—13-20 mm.

Type.—Cat. no. 26280 U. S. N. M.

Paratypes.—In National Collection, American Museum and collection Barnes.

Type locality.—Arlington, Virginia.

Food plant.—*Scirpus fluviatilis*.

Described from male type, two male and one female paratypes from the type locality reared July 1, 1920, from *Scirpus fluviatilis*; 1 male and 1 female paratypes from Vineyard, Utah (Tom Spalding, "VI-2-12" and "IX-1-12"), and one female paratype from Linton, Indiana (J. J. Davis, "VII- , 13-1916, from Grass").

It can be easily recognized by the prominent fuscous streak through the middle of the wing. The male genitalia are of the *verutana* type but the heavy spines on cucullus are crowded toward the lower margin and not in two lines as in Zeller's species.

Bactra priapela, new species.

Similar to *maiorina* but darker and with different genitalia. The central longitudinal streak on fore wing is also present in this species but is less strongly contrasted against the ground color, the entire wing being more or less suffused

with fuscous; the costal strigulations are also longer and more pronounced. Palpus spotted on outer side with fuscous; third joint fuscous. The most striking character is the aedoeagus of the genitalia; this is slender, very long, and curved in a half circle. It at once distinguishes the species.

Alar expanse.—16-17 mm.

Type.—In collection Cornell University (Cornell type No. 661).

Paratypes.—Cat. no. 26281 U. S. N. M. Also in collection Cornell University.

Type locality.—Sabine River Ferry, Louisiana.

Food plant.—Unknown.

Described from male type, 1 male and 1 female paratypes from the type locality (Cornell University Lot 542, sub 20); one male paratype from Shriever, Louisiana (Cornell University, Lot 542, sub 14); and one male paratype from Victoria, Texas (Cornell University, Lot 542, sub 27).

The specimens are in rather poor condition but a name is desired and as the genitalia are like those of no other North American species I do not hesitate to describe them as new. The species can be recognized at once by its abnormally long, curved aedoeagus.

***Polychrosis spiraeifolia*, new species.**

Antenna ochreous, shaded above with blackish fuscous. Palpus pale sordid ochreous; second joint much shaded with fuscous on outer side; terminal joint pale. Head and thorax purplish fuscous with a slight shading of dull ochreous especially on front and tegula. Fore wing with basal patch sharply contrasted against metallic antimedial band, blackish fuscous with metallic scaling appreciable only towards base, its outer margin angulate and outwardly slanting in straight line from costa before one-fifth to lower margin of cell then inward to vein 1b and then outward again to dorsum at one-fourth; antimedial band as wide on costa as on dorsum divided by a vertical dark brownish (or blackish) fuscous line at least from costa to middle and with outer margin outwardly curved; median band slanting outward a trifle towards dorsum, roughly triangular, with apex of triangle (tooth of median band) at upper outer angle of cell, blackish fuscous with a strong dusting of ochre yellow or brownish ochreous scales, especially on dorsal half of band; against upper outer angle of cell (above and touching the tooth of the band) and visible to the naked eye, an oval ochreous spot; pretornal spot triangular, blackish fuscous more or less dusted with ochre yellow, or brownish ochreous; this ochreous color predominant upon the other dark areas especially subapical spot which shows little or no blackish scaling; subapical spot paler than median band, lying parallel to termen, carrot shaped, touching tornus below and connected above to second costal spot, on inner side to the long first costal spot and on outer side by a spur with middle of termen; third costal spot short; fourth rather long and heavily shaded with blackish, to the naked eye appearing as a black spot at apex; in unrubbed specimens the basal patch, median bar and costal spots, and sometimes the subtornal and subapical dark areas, show under magnification a faint edging of whitish scales;

postmedian pale area leaden metallic; cilia dark purplish fuscous. Hind wing smoky brown; cilia pale with a dark basal band. Underside of fore and hind wings pale smoky brown; the outer costal markings of fore wing indicated by short obscure whitish ochreous dashes.

Alar expanse.—8-10 mm.

Type.—In collection Barnes.

Paratypes.—Cat. no. 26282 U. S. N. M. Also in American Museum and collection Barnes.

Type locality.—Hazelton, Pennsylvania.

Food plant.—*Spiraea salicifolia*.

Described from male type, one male and three female paratypes from the type locality, labeled "Bred from *Spiraea salicifolia*, 5/29-19c" (2 males and 2 females) and "5/30-19c" (one female); and one paratype from Hampton, New Hampshire (S. A. Shaw, "8-9-1905"): these from a series of moths which Kearfott had set aside as a new species under the manuscript name here adopted.

An obscure species closely resembling *ambrosiana* Kearfott from which it is distinguishable superficially only by its paler subapical spot. The genitalia (male and female) of the two species are, however, enough different to prevent confusion. They are very similar in *spiraefoliana* and *yaracana* Kearfott; but the latter is at once distinguished by its paler hind wings and the strong white scaling on the borders of all the dark pattern areas.

Episimus tyrius, new species.

Palpus reddish purple; whitish along upper inner edge of second joint. Head reddish purple in front, shaded with ochreous white above. Thorax whitish with anterior margin reddish purple and a scattering of lead colored scales behind. Fore wing to the naked eye with a large reddish purple costal patch covering most of basal half of wing; outer margin of patch concave, extending from outer fourth of costa to just above dorsum before one-half, here the patch is rounded and its lower margin curved up to base of cell; the dorsal area bordering the patch is white with a slight spotting of leaden scales giving the ground color a somewhat ashy appearance; the outer part of wing is orange yellow somewhat darker and more brownish toward termen, with a faint purplish suffusion over pretornal area and a similar small spot on costa just before apex; under slight magnification two brownish red patches are distinguishable in the purple basal area, an oblong one at its lower outer angle extending to the cell and another from midcosta extending obliquely to outer edge of the purple area; ocellus of the usual *Episimus* type with three very short longitudinal dark brown red dashes and an outer vertical metallic bar outward by edged by a curved white line; tornal area below ocellus leaden; at apex a fine white line from costa to termen, just below this a similar short white dash inward from termen; cilia brownish yellow. Hind wing fuscous; cilia concolorous, with a faint yellowish tint toward apex.

Alar expanse.—15–15.5 mm.

Type.—In collection Cornell University (Cornell type No. 662).

Paratype.—In collection Barnes.

Type locality.—Westbury Station, Queens County, New York.

Food plant.—*Acer dasycarpum*.

Described from female type reared by M. V. Slingerland, Nov. 21, 1894, from larva attacking the terminal shoots of Silver Maple ("C. U. Exp. no. 463"); and one female paratype from the Barnes collection taken at St. Petersburg, Florida ("April"). According to the Slingerland notes there should be two other specimens in the Fernald collection. I have not seen these.

Dr. Forbes has kindly secured for me from Professor Crosby copies of notes and correspondence at Cornell relating to this species. The following extracts from these give all that is known of the life history and habits of the insect:

"The attack is first noticed as a crisping of the small leaves around the terminal bud of the leader of vigorous shoot. These are bent downward and slightly webbed together. The worm is usually found in a tunnel $\frac{1}{4}$ to 1 inch long in the center of the young shoot. Rarely the worm uses a large leaf stalk for his tunnel. The worm is $\frac{1}{4}$ – $\frac{5}{8}$ inch long, reddish brown, naked and smooth, and very active when disturbed. The head is round and black, smaller than the body in diameter.

"It occurs on young blocks 3–6 ft. high and is not seen on larger trees. As this is the part which forms the tree it is important that it be straight. After the attack two or more lateral shoots will form. There is therefore a loss in the height and straightness of the tree and the labor of extra pruning.

"I first noticed it on about 5% of the trees in June. Now about 50% are attacked. It has not been noticed by those who have pruned these trees in previous years." (From letter of Henry Hicks to Mr. M. V. Slingerland, Sept. 24, 1894.)

"Silver Maple Tip Worm.

"26 Sept. '94.—Rec'd from Henry Hicks (see letter) specimens of injured tips some of which still contained larvae. Put tips in cage to try and breed adults. Found one large larva in twisted rolled up dead dry leaf. It was about $\frac{1}{2}$ inch long, dark crimson red, with light brown head and thoracic shield, and blackish legs and anal shield. Tuberculous spots slightly darker (greenish) than body color. Put a smaller larva in alcohol in its burrow. The smaller larvae vary in color from light yellow through brownish to the reddish tinge.

"21 Nov. '94.—A moth emerged and is pinned with its empty pupa case.

"6 Dec. '94.—Another moth emerged and is pinned. (18 Dec. '94.) Sent this last specimen to Dr. Fernald.

"21 Dec. '94.—Found a moth dead in cage. In attempting to spread it the wings came off from one side so it is pinned unspread. Pinned 2 empty cases also. Later (Jan. 3, '95). This moth was a male and has been sent to Prof. Fernald." (Slingerland notes to Exp. no. 463.)

***Endothenia infuscata*, new species.**

Like *nubilana* Clemens but more uniformly colored and without the contrasted median, pretornal and subapical markings of that species. Head, thorax and fore wing brown with the usual (*Exartema* type) median, pretornal and subapical markings but faintly indicated and scarcely darker than rest of wing. Hind wing brownish fuscous, a trifle paler than fore wing; cilia paler with a darker basal band; veins 6-7 short stalked. Hind tibia of male without hair pencil. Genitalia of male with uncus strongly developed, narrowly spatulate; aedoeagus very heavy and short, apex extended as a thin chitinous tongue; penis without cornuti.

Alar expanse.—17-20 mm.

Type.—Cat. no. 26283 U. S. N. M.

Paratypes.—In collection Cornell University (Cornell paratype No. 663),

Type locality.—Forest Glen, Maryland.

Food Plant.—Unknown.

Described from male type from the type locality (Otto Heideman, "7-10-14") and 2 male paratypes from Ithaca, New York, the latter received through Dr. W. T. M. Forbes.

In genitalia this species most resembles *conditana* Walsingham. The latter, however, is a much smaller species with correspondingly smaller genitalia. The other two species which most closely resembles it in markings (*vetulana* Walsingham and *nubilana* Clemens) both have broadly spatulate unci and numerous strong cornuti. For it and for those species, now listed under *Olethreutes*, having veins 6-7 of hind wings stalked, and strongly chitinized unci (i. e. *montanana* Kearfott, *rubipunctana* Kearfott, *melanostica* Walsingham, *hebesana* Walker, *daeckiana* Kearfott, *conditana* Walsingham, *vetulana* Walsingham and *nubilana* Clemens) I am reviving Stephens' genus *Endothenia* (type: *Tortrix gentianana* Hübner).

Genus EXARTEMA Clemens.

For convenience of identification the species belonging to this genus may be arranged in three groups upon a character in the male genitalia. In one group there is a spined digitus projecting from the neck of the harpe close to the sacculus. In the following descriptions genitalia with this character are referred to as "of the *nitidanum* type." Another group has the digitus projecting from the neck well away from the sacculus (closer to the cucullus). This is the "*permundanum* type." A few other species (*concinnum* Clemens, *appendiceum* Zeller

ferriferanum Walker, *fasciatanum* Clemens and *troglodanum* McDunnough) constituting what may be called the third group, have no digitus, the spine cluster homologous with it being modified in quite a different fashion. None of the new species in this paper belong in this last group.

***Exartema subnubilum*, new species.**

Male genitalia of the *nitidanum* type.

Antenna brownish fuscous. Palpus whitish ochreous; second joint shaded with fuscous towards apex; third joint blackish fuscous. Head and thorax brussels brown; head with a darker shading above and a somewhat paler one (more ochreous fuscous) on sides. Fore wing with pattern markings brussels brown; pale areas metallic, somewhat suffused with sordid brownish ochreous scaling giving them to the naked eye a pale bluish-grey-fuscous shade; basal patch outwardly angulate with an excavation below middle; antimedial pale area much lined with fuscous especially toward dorsum, darker than post median area and less contrasted against brown pattern markings. Median band with outer teeth pointed, moderately long and rather wide apart, dorsal portion of median band roughly triangular; pretornal spot triangular, its separation from median band somewhat obscured by the fuscous dusting on the pale area between them; subapical bar swollen toward extremity, narrow at termen, connected by a fine line with first costal spot, well separated from upper tooth of median band, apical costal spot extended downward along termen to base of subapical bar; cilia shining fuscous with a darker brown basal band and in some specimens with a pale whitish ochreous shading at tornus. Hind wing tawney fuscous; cilia whitish with a dark basal band; in male a notch at vein 5, another at 1c and a decided incurvation at 1b. Underside of hind wing decidedly paler than underside of fore wing. Bursa of female with signum.

Alar expanse.—15-17 mm.

Type.—In American Museum.

Paratypes.—Cat. no. 26284 U. S. N. M. Also in American Museum and collection Barnes.

Type locality.—Greenwood Lake, New Jersey.

Food plant.—Hazel.

Described from male type and 5 female paratypes all from the type locality and labeled "Bred Hazel" and dated "VI-25" and "VI-26"; and one female paratype from Mountain Lake, Maryland, dated "VII-30-06."

A dark species very similar to *sciotanum* in general appearance; but smaller without the fine pale line between upper and lower teeth of median bar and with male genitalia of quite a different type.

***Exartema electrofuscum*, new species.**

Male genitalia of the *nitidanum* type.

Antenna ochreous fuscous; basal joint pale ochreous. Palpus cream white; second joint with a slight indication of the usual two dark spots on outer side and a faint shading of fuscous at extreme apex; third joint pale with a fuscous shading above. Head ochreous sometimes with a peppering of darker (more

brownish or ferruginous) scaling above. Thorax ochreous; paler on collar and tegula; more or less dusted with fuscous; to the naked eye a brownish shade concolorous with dark markings of fore wing. Fore wing with dark pattern markings, grading from antique to amber brown in different specimens; under magnification showing these same areas as fuscous heavily overlaid with coarse ochreous or ferruginous scales and towards outer half of wing faintly edged with whitish ochreous; basal patch broken towards base by vertical streaks of whitish ochreous, outwardly angulate with a slight excavation below middle, its outer margin beginning on costa at $\frac{1}{3}$ from base and ending on dorsum at nearly $\frac{1}{2}$; antimedial band twice as broad on costa as on dorsum, with a fine median vertical dark line and on costa enclosing three brown dashes, the middle one almost as large as any of the outer costal spots; median band continued to dorsum, outer teeth short and widely spaced; pretornal spot rather narrow, distinct, but with pale area between it and median band somewhat narrowed and dusted with dark scaling; subapical bar cornicopia shaped, connected by lines of dark scales with first costal and pretornal spots; last three outer costal dark spots fusing together below apex and extending as a narrow band almost to base of subapical band; between this fused extension and termen, a pale whitish ochreous line; post median pale area showing to the naked eye a faint ochreous clouding especially at tornus and near apex; cilia pale ochreous with a brown basal line and a clouding of fuscous at apex and opposite base of subapical bar. Hind wing tawney fuscous; cilia paler with a dark basal band which becomes obsolete at anal angle; in male a notch at vein 1b and a very slight one at 5. Underside of hind wing much paler than underside of fore wing. Bursa of female without signum.

Alar expanse.—15-17 mm.

Type.—In American Museum.

Paratypes.—Cat. no. 26285 U. S. N. M. Also in American Museum and collection Barnes.

Type locality.—Lakehurst, New Jersey.

Food plant.—Sweet Fern.

Described from male type, 3 male and 2 female paratypes from the type locality ("VII-4-09, W. D. Kearfott"); 2 male paratypes from Center Harbor, New Hampshire (H. G. Dyar nos. "18286" and "18415"), and one male paratype from Medford, Massachusetts (reared from Sweet Fern, 21 May, 1921, W. O. Ellis, "no. 2119-1"). In addition to the foregoing I have before me another reared male from Medford (data same as for paratype from same locality). In genitalia this specimen agrees with the others; but its dark markings are olivaceous brown and the subapical bar is differently shaped and does not connect with pretornal spot. The teeth of median band are also a trifle longer than in typical specimens. I am not including it among the paratypes, but, in spite of the differences noted, think it should be referred here.

The species is closest to *zellerianum* Fernald but decidedly less ferruginous and with antimedial and postmedian areas of fore wing paler. In color it is about midway between *subnubilum*

and *zellerianum*. It also much resembles *rusticanum* McDunnough from which it is distinguished by the paler, brighter brown markings of its fore wing and the weaker spining near the base of cucullus of harpe. Kearfott had set several of the specimens aside as a new species under the manuscript name "*liniafasciana*." As the latter is somewhat misleading I have substituted a more appropriate name.

***Exartema connanum*, new species.**

Genitalia of the *nitidanum* type.

An olivaceous drab species with the usual markings obsolete except for a strong dark brown bar or patch at lower inner angle of fore wing.

Palpus cream or pale ochreous white with a slight fuscous shading towards tip of second joint below and one or two round fuscous spots on outer side; third joint fuscous with extreme apex whitish. Side of head, thoracic collar and a triangle comprising the outer anterior half of tegula, pale olivaceous ochreous; head and thorax otherwise dark brownish fuscous. Fore wing with basal patch sharply defined and not extending above cell; costal area of wing at base pale whitish ochreous, this pale shade extending along cell and broadening out at its end towards apex and tornus thus dividing the darker ground color into three very faintly contrasted areas, a triangular shading on midcosta, a similar one on termen and an obscure blotch covering dorsal half of wing almost to tornus; costa faintly marked from base to apex with very short brown geminations; a small brown dot at end of cell; cilia fuscous with a blackish-brown basal band; underside of wing with the costa pale ochreous and the dark geminations of upperside repeated as brown dots. Hind wing whitish toward base, shading to dark smoky fuscous towards apex and termen; cilia white with dark basal band; in male an appreciable notch at vein 5, a decided notch at vein 1c and another at 1b.

Alar expanse.—17.5–18 mm.

Type.—In American Museum.

Paratype.—Cat. no. 26286 U. S. N. M., also in collection Barnes.

Type locality.—Essex County Park, New Jersey.

Food plant.—*Cornus canadensis*.

Described from male type labeled "K 600B, *Cornus* c., iss. VII-6"; one male paratype from Essex County Park, New Jersey (July 4, Kearfott); and one male paratype from Caldwell, New Jersey (July 4, 1903, Kearfott). These had been set aside by Kearfott as a new species and had been given the manuscript name "*connutana*."

An easily recognized species. In pattern and genitalia closest to *punctanum* Walsingham, *inornatanum* Clemens and *clavanum* Walker. It differs from the first in that there is no distinct median dark costal patch fusing with the dark basal patch. It is paler than *inornatanum* and lacks the red scaling on thorax and lower inner angle of fore wing so characteristic of that species. In *clavanum* the basal patch is continued in a blackish

shading which extends along dorsum to beyond middle and the median costal patch is blackish fuscous and more strongly contrasted against the pale central suffusion than that of *connanum*.

***Exartema mediopartitum*, new species.**

A small species with pattern of *corylanum* Fernald but lacking the ferruginous cilia and with genitalia of the *nitidanum* type.

Antenna ochreous fuscous; first joint pale sordid ochreous with a smudge of fuscous on upper side. Palpus sordid white; second joint with the usual two fuscous spots on outer side but with little or no fuscous shading at apex; third joint whitish ochreous with a broad central fuscous band. Head and thorax pale sordid ochreous somewhat dusted with fuscous. Fore wing with dark areas a dark fuscous brown overlaid with coarse pale ochreous scaling giving them an ochreous drab color to the naked eye; dark markings faintly outlined with whitish ochreous; pale areas dull whitish ochreous, the metallic scaling only apparent under magnification; basal patch outwardly angulate, ending abruptly below costa, the outer margin alone indicated at costa by a narrow fuscous dash; costa pale; antimedial band with two narrow median lines of dark scaling; median dark band broken in middle, costal part consisting of a rather narrow rhomboid patch, dorsal half fused with pretornal spot forming a single large semioval spot on outer half of dorsum; subapical bar the same width for most of its length, apex tapered, joining first costal dash; outer costal dashes narrow, that at apex the longest extending along termen as far as base of subapical bar; termen edged with a fine whitish ochreous line; cilia pale whitish ochreous with a fuscous basal band, a smoky fuscous spot at apex and another opposite base of subapical band. Hind wing pale ochreous fuscous; cilia whitish with a dark basal band; male with appreciable notches at veins 5 and 1c, hardly a trace of one at vein 1b. Underside of fore wing pale fuscous drab; costa and termen ochreous. Undersides of hind wing sordid whitish.

Alar expanse.—13 mm.

Type.—Cat. no. 26287 U. S. N. M.

Type locality.—Virginia.

Food plant.—Unknown.

Described from male type and one male paratype labeled "Va. June 1-84." These had been in the National Collection for years under the name of *corylanum* Fernald along with specimens of the true *corylanum*. The type labeled in Fernald's handwriting "*Eccopsis corylana* Fernald." It resembles that species in general color and markings; but has quite different genitalia. These of *corylanum* are of the *permundanum* type. Fernald's species also has ferruginous ochreous cilia on fore wing, a character which at once identifies it.

***Exartema tilianum*, new species.**

Pattern and genitalia of the *permundanum* type.

Antenna ochreous with a dark brownish fuscous spot on upper side of first joint at base; second joint dark brownish fuscous above. Palpus whitish ochreous; second joint with one or two fuscous spots on outer side and some fuscous

scaling at apex; terminal joint dark brownish fuscous with extreme tip whitish ochreous. Head ochreous; a dark brownish fuscous shading on each side of frontal tuft. Thorax ochraceous-tawney with more or less dusting of pale ochreous especially upon anterior half of tegula. Fore wing with basal and median areas, outer costal and pretornal spots and subcostal bar brown overlaid with ochreous, giving them an ochraceous-tawney hue to the naked eye; in dark or rubbed specimens the brown ground color is more prominent especially on basal patch, pretornal spot and subapical bar, but the ochraceous-tawney shade is always predominant on median bar, especially towards dorsum; in paler unrubbed specimens all aforementioned areas are a uniform ochraceous-tawney; antimedial and postmedian pale areas leaden metallic, faintly interlined with fuscous; basal patch continuing to costa, at least on its outer margin, the pale scaling on base of costa somewhat obscuring but not sharply cutting off the patch; antimedial pale bar divided towards dorsum and enclosing a dorsal spot detached from basal patch; median band with a deep indentation on the outer side below lower tooth, teeth long and narrowly separated, the upper touching or nearly touching subapical bar, the lower equally long and bluntly pointed; dorsal portion of median band roughly diamond shaped, distinctly separated from the pretornal spot; cilia tawney, more or less shaded with pale ochreous below costa and at tornus and with a dark fuscous basal band. Hind wing ochraceous-tawney; cilia whitish with a dark basal band; in male a slight notch at vein 5, and decided notches at veins 1c and 1b.

Alar expanse.—18-20 mm.

Type.—In American Museum.

Paratypes.—Cat. no. 26288 U. S. N. M., also in American Museum and collection Barnes.

Type locality.—Greenwood Lake, New Jersey.

Food plant.—*Tilia americana*.

Described from male type from type locality (dated July 3, 1909, Kearfott, collector); one male paratype from Missouri (labeled: "122 M.-6-20-79, C. Mo."); one female paratype (without abdomen) from Cincinnati, Ohio (A. F. Braun, "VI-7-08"), all reared from basswood; and one female paratype from Chicago, Illinois, collected "7-12-02" (Kwiat). In addition to the above I have before me a female from Lacy, New Jersey ("VII-14-07"), with the same color and pattern except that the upper tooth of the median bar is rather short and the subapical bar is definitely connected to the first of the four outer costal dark dashes rather than to the upper tooth of the median bar. Kearfott had included it among the "types" of his intended new species and it probably should be referred here but as it is somewhat doubtful I do not include it among the paratypes. Kearfott's manuscript name has been adopted.

The new species is closest to *permundatum* Clemens and *nigranum* Heinrich. From the latter it is distinguished by its paler markings and from the former by the length of the teeth of the median bar of fore wing. These are long in *tilianum* and short in *permundatum*. From both *nigranum* and *permun-*

danum it is distinguished by the broadened tip of the uncus of its male genitalia. The extremity of this organ is narrow in the other two species.

***Exartema sciotanum*, new species.**

Male genitalia of the *permundanum* type.

Antenna ochreous fuscous with entire upper surface of first and second joints dark brownish fuscous. Palpus whitish ochreous; second joint with two fuscous spots on outer side and much shaded with fuscous toward extremity; third joint blackish fuscous. Head and thorax brussels brown with a slight shading of dull ochre yellow, especially on anterior third of tegula. Fore wing with pattern markings brussels brown, and somewhat obscured especially on dorsum and towards base; the upper tooth of median bar, the subapical bar and pretornal spot are definite but the antimedial pale area is so suffused with brown scales that it blends with and blurs the median and basal dark areas; outer teeth of median band short, the *upper divided from the lower by a short thin ochreous line*; subapical bar cornicopia shape, terminating abruptly, narrowest at termen; postmedian area dull, somewhat suffused with fuscous and sordid ochreous scaling; cilia dull fuscous with a darker basal band. Hind wing tawney fuscous slightly paler towards base and costa; cilia whitish with dark basal band; in male a notch at vein 1b but no appreciable notch at either 1c or vein 5. Bursa of female without signum.

Alar expanse.—19–21 mm.

Type.—In American Museum.

Paratypes.—Cat. no. 26289 U. S. N. M., also in American Museum and collection Barnes.

Type locality.—Cincinnati, Ohio.

Food plant.—Unknown.

Described from male type, one male and two female paratypes from the type locality (Annette F. Braun, collector) and dated as follows: type and one female paratype, "V-25-04;" one male paratype, "VI-3-06;" and one female paratype, "VII-10-04." Kearfott had these set aside as a new species under the manuscript name here adopted.

The species is most easily recognized, and distinguished from others in the same group with similar color and markings, by the fine ochreous line dividing the upper and lower teeth of the median band.

***Exartema nigranum*, new species.**

Under the manuscript names "*nigrana*," "*octinigranum*," "*nigriliniana*" and "*nigridorsana*," Kearfott had separated what appeared to be four different species; a careful study of their genitalia, male and female shows them to be only color varieties of a single variable species. The extreme forms are strikingly different in pattern but there are so many intergrading specimens that no separation can be maintained. I am selecting the type of the species from the form in which the usual *Exartema*

pattern is most clearly defined and framing the description so as to include all the varieties.

Male genitalia of the *permundatum* type.

Antenna fuscous; basal and second joint with one or two blackish fuscous spots on outer side and more or less fuscous shading towards apex; third joint blackish fuscous with extreme apex whitish ochreous. Head dark brownish fuscous above; sides and front pale sordid ochreous, lower anterior edge of frontal tuft blackish fuscous (in some of the paler specimens this dark shading is not present, but in most it is conspicuous as a dark transverse bar above the face). Thorax dark brownish fuscous; anterior third of tegula dull ochre yellow. Fore wing with pattern markings brussels brown to dark fuscous brown, in the darkest specimens with a purplish tint; basal patch not reaching to costa; base of costa dull ochre yellow; a fine ochreous line along top of cell at base, dividing the basal patch and leaving its upper margin as a fuscous subcostal line; median band with teeth long and widely spaced, upper tooth touching or nearly touching subapical bar; median band with a deep indentation on outer side below tooth, in many specimens the dorsal portion of the band is entirely detached from the teeth and is *often fused at its outer dorsal angle with the pretornal patch*; outer third of costa with the usual four brownish triangular spots; antimedial and post-medial pale areas cinnamon drab with a faint purplish suffusion, the dark suffusion most intense on dorsum of antimedial area; in some specimens the basal patch, dorsal portion of median band and pretornal patch are fused into one continuous purplish fuscous blotch extending to tornus and with the outer edge oblique from near end of cell; cilia dark brownish fuscous with little or no ochreous scaling and with a blackish basal line. Hind wing whitish toward base; dark smoky fuscous toward apex and termen; cilia sordid whitish with a rather broad dark basal line; in male a slight notch at vein 1c and a more decided one at 1b.

The most extreme variety has nearly all the usual markings on costal half and outer third of fore wing obscured or obsolete and a continuous purplish fuscous blotch covering the dorsum as noted above; sometimes the costal half of median bar is represented by both teeth, sometimes by only the upper and in many specimens by only a small dark smudge on midcosta; the outer costal spots and subapical bar though faint are usually indicated but these too may be obscured and are sometimes obliterated; in such forms the color of the wing aside from the dark dorsal patch varies from a pinkish cinnamon to a very pale buff.

Alar expanse.—17-22 mm.

Type.—In American Museum.

Paratype.—Cat. no. 26290 U. S. N. M. Also in American Museum and collection Barnes.

Type locality.—Cincinnati, Ohio.

Food plant.—Unknown.

Described from male type, 30 male and 8 female paratypes out of a large series collected by Miss Annette F. Braun at the type locality and bearing various June dates. Aside from these I have before me specimens from Algonquin and Chicago,

Illinois (July and August), New Brighton, Pennsylvania (June and August), Winchendon, Massachusetts (June-July), Illion and South Wales, New York (May 25 and June 13), Essex County, New Jersey and Hamilton, Ontario.

This species is closest to *tilianum* and *sciotanum*. From the former it is distinguished by the dark brownish color of its pattern markings and from the latter by the absence of the fine line dividing the upper and lower teeth of median band. The lower tooth is often missing altogether in *nigranum* but when it is at all appreciable it is not separated from the upper one. In *tilianum* it is always present.

***Exartema ochrosuffusum*, new species.**

Genitalia of the *permundanum* type.

An obscurely marked species with pattern much like that of *corylanum* Fernald.

Antenna ochreous fuscous with upper surface of first and second joints blotched with fuscous; basal joint otherwise strongly shaded with raw sienna. Palpus sordid whitish ochreous; second joint with one or two fuscous spots on outer side, a clouding of fuscous at apex of tuft and a slight shading of yellow at upper inner angle; third joint fuscous with extreme apex whitish ochreous. Head and thorax raw sienna yellow or (in darker and more rubbed specimens) brownish fuscous shaded and dusted with sienna.

Fore wing with pattern markings partially obliterated, consisting of a basal patch, a short rhomboid patch on midcosta and an obscure spot at end of cell representing the remains of the median dark band, the pretornal patch, subapical bar and four outer costal dashes; these are either raw sienna yellow or soudan brown in color; the rest of the wing is of the same general color with a paler more purplish suffusion due to the metallic scaling; in rubbed specimens the blackish fuscous underscaling of the aforementioned dark areas makes them stand out in sharper contrast than they do in fresh specimens where there is a more or less yellow or brownish suffusion over the entire wing; basal patch not reaching above cell; costa at base pale, shining, of a lighter yellow than basal patch; subapical bar joining first costal dash; cilia pale fuscous with a yellowish or brownish basal line; underside of wing pale shining smoky fuscous with costa rather broadly edged with dull cream white. Hind wing pale smoky fuscous; cilia whitish with dark basal band; underside of wing shining whitish with little or no fuscous shading towards apex; male with slight notch at vein 1b and a trace of one at vein 5.

Alar expanse.—19-20.5 mm.

Type.—In American Museum.

Paratypes.—Cat. no. 26291 U. S. N. M. Also in American Museum and collection Barnes.

Type locality.—Cincinnati, Ohio.

Food plant.—Unknown.

Described from male type and 4 female paratypes from the type locality collected by Miss Annette F. Braun and dated as

follows: type and 3 paratypes, "VI-3-06" and one paratype "VI-16-06;" one female paratype from Quincey, Illinois (Poling, June 5-'98); and one female paratype from Onaga, Kansas (Crevecoeur). These had been set aside by Kearfott as a new species under the manuscript name here adopted.

***Exartema brunneopurpuratum*, new species.**

A small brown and metallic purple species with pattern markings distinct and sharply defined.

Antenna ochreous fuscous with a dark purplish brown (almost black) spot on upper side of basal joint and a similar shade on upper side of next three or four joints. Palpus dull cream color; second joint with a couple of small fuscous spots on outer side and a very faint purplish fuscous shading at apex; third joint dark purplish fuscous. Head purplish fuscous above; dull sordid ochreous upon sides and front, with a purplish shading upon each side of frontal tuft. Thorax purplish brown with a faint transverse suffusion of dull ochreous scaling. Fore wing with basal and median areas, pretornal and costal spots and subapical bar a rich dark brown slightly dusted with blackish scales and narrowly margined with white; rest of wing a metallic leaden purple; basal patch the darkest of the brown areas and most heavily dusted with black; its outer margin slanting out from costa at slightly less than one-fifth to just above basal fourth of upper vein of cell, slightly rounded at this point, thence vertical to lower vein of cell and from here slanting sharply inward to basal fifth of dorsum; antimedial metallic area divided by a clearly defined slightly sinuate median vertical brown line and containing at dorsum a small triangular brown spot detached from basal patch, between this and outer margin of basal patch a second short line of blackish brown scales; median band consisting of the usual two teeth and a triangular dorsal spot with apex pointed outward and upper inner angle attached to lower tooth, teeth moderately long, upper narrowly triangular, pointed and almost touching upper inner angle of subapical bar, lower tooth club-shaped; pretornal spot triangular with apex pointed; subapical bar elongately triangular, narrow at termen and broadening out towards costa, not connected with any of the costal dashes; last (apical) costal spot narrow and obscure; in antimedial leaden purple area, a dark brown line between median band and pretornal spot and another from tornus to a point between the teeth of median band and touching at its middle the apex of the subornal spot; cilia leaden fuscous with a blackish basal band. Hind wing a uniform amber brown; cilia pale fuscous with a dark basal band. Underside of fore wing a pale fuscous brown with a faint purplish iridescence and a very indistinct ochreous costal strigulation. Underside of hind wing slightly paler than underside of fore wing.

Alar expanse.—14-14.5 mm.

Type.—Cat. no. 26292 U. S. N. M.

Type locality.—Falls Church, Virginia.

Food plant.—*Alnus*.

Described from female type and one female paratype reared under Hopkins U. S. no. 11172 from larvae collected July 18, 1913 (Heinrich); moths issuing Aug. 1 and 19, 1913. The larva ties the young terminal leaves of alder. It is pale greenish yellow

with body segments broadly, transversely banded with pink; head and thoracic shield pale yellow; length full grown, 12 mm.

A handsome little species easily identified by its brown and purple color.

***Exartema melanomesum*, new species.**

Male genitalia of the *permundatum* type.

Antenna ochreous. Palpus whitish; second joint with the usual two blackish spots on side and a slight fuscous shading at apex; third joint blackish fuscous. Head ochreous with a faint fuscous shading above. Thorax dark brownish fuscous faintly dusted with ferruginous ochreous or rosy ochreous. Fore wing with pattern markings dark brownish fuscous dusted with ferruginous ochreous or rosy ochreous; the pale antimedial and postmedial areas closely and finely lined with fuscous and somewhat sprinkled with ochreous giving them a faint pale rosy or ochreous shade to the naked eye; basal patch reaching costa, outwardly angulate with an excavation below middle; median band darkest (blackish brown) toward costa, upper tooth moderate, lower long, touching or almost touching subapical bar, dorsal portion of median bar roughly triangular; pretornal spot well separated from dorsal part of median bar, connected by a fine line with lower tooth and subapical bar; subapical bar club-shaped, narrow at termen, darkest (blackish brown) toward its apex; cilia ochreous, spotted with fuscous and with a dark brown basal band. Hind wing smoky fuscous; paler towards base; cilia whitish with a dark basal band; in male slight notches at veins 5, 1c and 1b. Underside of fore and hind wings nearly concolorous.

Alar expanse.—15-17 mm.

Type.—In collection Barnes.

Paratype.—Cat. no. 26293 U. S. N. M. Also in American Museum and collection Cornell University. (Cornell paratype No. 664).

Type locality.—Sebec Lake, Maine.

Food plant.—Unknown.

Described from male type ("July 16-23"), one male paratype from Ithaca, New York (10 July, 1916, W. T. M. Forbes), and 2 male paratypes from Essex County Park, New Jersey (July 1, W. D. Kearfott).

A distinct species. In the dark shading on median band resembling *footianum* but with quite different genitalia. One of the paratypes from Essex County is paler than the others and has little of the characteristic dark shading on median band and subapical bar. The pattern otherwise and the genitalia show that it belongs here.

***Exartema quebecense*, new species.**

A tawney ferruginous species with the usual fore wing markings defined by much restricted antimedial and postmedial metallic bands.

Male genitalia of the *permundatum* type.

Antenna fuscous; basal joint sordid ochreous drab with a blackish spot on upperside. Palpus sordid whitish; second joint with a fuscous spot on outer side and a fuscous shading toward apex; third joint fuscous. Head sordid

ochreous drab. Thorax tawney ferruginous with a dusting of fuscous in tuft. Fore wing tawney ferruginous; basal patch complete to costa, outer margin somewhat sinuate, nearly vertical; antimedial band consisting of two thin leaden metallic lines separate by a broader streak of the ground color and converging and weakening toward dorsum; median band with a very short, pointed upper tooth, a considerably longer, broader, lower tooth and an outwardly angulate dorsal patch joined to lower tooth; on outer part of lower tooth some slight dusting of blackish scales; post median band consisting of a pair of thin metallic lines fusing below costa into a single rather narrow band bordering median band and forking at the middle to define the pretornal patch; the latter is roughly triangular with rounded apex and a faint submarginal line of blackish scales following the outline of the patch; outer costal spots and subapical bar considerably fused together, making entire apical area beyond postmedian band, tawney ferruginous; costal spots faintly separated at costa only by very short white dashes, and subapical bar partially defined by a thin broken line of metallic scales along its outer margin; cilia dull tawney ochreous with a fuscous spot at apex. Hind wing uniform Vandyke brown; cilia slightly paler with an obscure, broad, dark basal band; male with only a slight notch at vein 5. Under-side of fore and hind wings a glossy drab, unicolorous and unmarked.

Alar expanse.—13 mm.

Type.—In American Museum.

Type locality.—Quebec, Canada.

Food plant.—Unknown.

Described from unique male type labeled, "A. W. Hanham, Quebec." Kearfott had set it aside as a new species under the manuscript name "*quebecana*." It is a striking species not easily confused with anything else.

Subfamily LASPEYRESIINAE.

Pammene felicitana, new species.

Antenna grey dusted above with white. Palpus white. Head white in front, greyish above. Thorax grey, shaded with white, especially on anterior margin and on extremity of tegula. Fore wing blackish grey with a conspicuous oblong white spot on mid dorsum; this is about $\frac{1}{3}$ as long as the dorsal margin, extends up to cell and is continued along dorsal margin to base of wing as a white band $\frac{1}{2}$ the width of the patch itself, sometimes (in the female paratypes) it is broken by a small median dorsal spot or dash of the ground color; costa of fore wing faintly marked with whitish geminations on its outer half; from two of these outwardly slanting metallic blue bars connect with vertical bars of ocellus. Ocellus consisting of two vertical metallic blue bars enclosing three faint longitudinal black dashes, and a third inward and dorsally slanting metallic bar connecting the verticals below; termen edged by a black line, cut by a white dash below apex and another at vein 3; cilia greyish fuscous. Hind wing dark brownish fuscous; cilia white (somewhat smoky in the female paratypes) with a dark basal band.

Alar expanse.—13-14 mm.

Type.—In American Museum.

Paratype.—Cat. no. 26294 U. S. N. M. Also in American Museum and collection Barnes.

Type locality.—Montreal, Quebec, Canada.

Food plant.—Unknown.

Described from male type and one female paratype from the type locality (A. F. Winn, "17-VI-10" and "2-VIII-09"; and one male paratype from St. Hilaire, Quebec (A. F. Winn, "7-IX-07"); and one female paratype from Oak Station, Pennsylvania (F. Marloff, "June 19-07"). The paratype from Hilaire had been badly damaged by a Dermestid but genitalia and right hand pair of wings are intact.

This series had been set aside by Kearfott as a new species under the manuscript name here adopted. Aside from Walsingham's *texanana* (which I have not seen) it is so far the only known representation of the genus in this country.

Sereda, new genus.

Thorax smooth. Fore wing with termen straight and slanting; 12 veins, all separate; 7, 8 and 9 approximate; 7 to termen; 10 near 9; 11 from cell before one-half; upper internal vein of cell from between 10 and 11; 3, 4, 5 almost parallel, not approximate at termen; 2 from cell just beyond one-half, straight.

Hind wing *without pecten on lower median vein*; 8 veins; 6 and 7 approximate towards base; 5 straight and parallel with 4; 3 and 4 connate.

Male genitalia with a pair of hair tufts from intersegmental area back of tegumen; harpe with cucullus trigonate; neck very slender and neck incurvation deep; sacculus somewhat enlarged, weakly spined; tegumen simple; uncus and socii absent; gnathos a simple weakly chitinated band.

Female genitalia with ductus bursae short, chitinated and bent; signa two thorn like spines.

A monotypic genus derived from *Laspeyresia*. The absence of pecten would seem to place it in *Tortricidae*. Male and female genitalia and general habitus, however, clearly show that it belongs in the *Olethreutidae* and is simply a *Laspeyresia* that has lost the pecten.

Genotype: **Halonota lautana** Clemens.

Carpocapsa erotella, new species.

Palpus and face whitish. Antenna, head, thorax and fore wing shining drab brown. Fore wing a trifle darker beyond base; costa with a pair of white dashes just before middle, a pair just after middle, a single white spot a trifle beyond two-thirds and, just before apex, another pair; from first (inner) costal dashes a narrow metallic band, inwardly margined with white, curves outward to middle of dorsum; a similar metallic band, without the white edging, runs parallel with the first from the second pair of costal dashes, and forms, on its dorsal half, the inner vertical bar of the ocellus; from costal spot near two-thirds, a short metallic dash, another metallic bar from apical white dashes, interrupted below vein 7 and then continued parallel with termen to tornus, forming the outer bar of ocellus; coeloid patch very faintly dusted with ochreous, and with three or four small faint (almost obsolete) black dots against inner side of outer bar; termen

edged by a black line; cilia shining fuscous. Hind wing brown, concolorous with darker part of fore wing; cilia slightly paler with a dark basal band.

Alar expanse.—9–10 mm.

Type.—Cat. no. 26295 U. S. N. M.

Paratypes.—In National Collection and collection Cornell University (Cornell paratype No. 665).

Type locality.—Hyattsville, Maryland.

Food plant.—*Pinus taeda* (pitch nodule on).

Described from female type reared March 22, 1915, under Hopkins U. S. no. 12190a from larva taken feeding in pitch nodule on gallery of *Petrova comstockiana* Fernald in *Pinus taeda* (August Busck, collector); one male paratype without locality and labeled, "from galls of *Pinus taeda*, Aug. 7, 82;" one male paratype without locality, labeled, "no. 282501 Aug. 14, 82" (specimen without abdomen, head and right fore wing, but wings on left side in very good condition); and one paratype from Biloxi, Mississippi ("June 13, 1917, Cornell University, Lot 542, sub 11").

An easily recognized species, in pattern similar to *toreuta* Grote and *piperana* Kearfott but much smaller.

A REPORT ON A COLLECTION OF COCCIDAE FROM ARGENTINE II. (HEMIPTERA COCCIDAE).¹

BY HAROLD MORRISON, U. S. Bureau of Entomology.

In 1919 the writer published under the above title, an article discussing a collection of scale insects received by the Bureau of Entomology from Sr. P. Jorgensen. This collection was obtained in various parts of the Argentine Republic during the period 1909 to 1911. At the time of publication it was believed that all the specimens received from Sr. Jorgensen had been examined, but it was subsequently discovered that, due to the crowded condition of the general coccid collection at the U. S. National Museum, some of his material had been stored separately and had not been located at the time the bulk of the collection was studied. Under such circumstances it seems desirable to place on record the remainder of the species included in this material and to make some additions and correct some errors which, on Sr. Jorgensen's authority, appeared in the earlier paper.

A correction which needs particular notice is the following: Bomplana, Misiones Territory should be Bompland. The writer followed Stieler's Atlas of Modern Geography, 9th Edition, Gotha, 1912, which gives both in the index and on the map of this section of Argentine this name as "Bomplana," but he has been advised by Sr. Jorgensen that this is in error.

¹Proc. Ent. Soc. Wash. Vol. 21, No. 4, Apr. 1919, pp. 63–91.

He states further that the host of *Icerva minima* Morrison is *Suaeda divaurata* Mag. (Chenopodiaceae); that of *Asterolecanium viridulum* Cockerell is *Eupatorium* (Compositae); that of *Eriococcus mendozae* Morrison is *Prosopis alata* (Leguminosae); that of *Eriococcus leguminicola* Morrison is *Caesalpinia* sp. (Leguminosae) only; those of *Eriococcus brasiliensis* Cockerell are *Baccharis tridentata* Vahl. (22 c) and *Baccharis oxydonta* (710 b) (Compositae); that of *Erium armatum* (Hempel) is *Condalia lineata* A. Gr.; those of *Tachardia lycii* Leonardi are *Lycium gracile* M (3h) and *Lycium chilensis* B. (39c) (Solanaceae); one of *Ceroplastes grandis* Hempel (395a) is *Helietta cuspidata* Engl. (Rutaceae) and not *Actimostema lanceolata* as stated; one of *Ceroplastes novaesi* Hempel (721h) is *Baccharis serrutulae* and not merely "Compositae"; that of *Ceroplastes deciduosus* Morrison is *Sapium biglandulosum* (Euphorbiaceae) and not "Lapium"; that of *Ceroplastodes misiones* Morrison is *Baccharis oxydonta*; and that of *Saissetia argentina* Morrison is *Prosopis alata* (Leguminosae).

In addition Sr. Jorgensen has called attention to the following typographical errors that should be corrected: page 77 under *Ceroplastes grandis* Hempel, "*Vitex montividiensis*;" should read "*Vitex montividensis*"; page 82, under *Akermes bruneri* Cockerell "*Celtis itala*" should be "*Celtis tala*."

The writer is indebted to Miss Mabel Stehle for the figures of *Aspidiotus latastei* and to Miss Amalia Shoemaker for the remaining figures accompanying this paper.

The following species have been recognized in that portion of Sr. Jorgensen's collection which was not located until after the publication of the previous paper:

Family **Coccidae**.

Subfamily **Monophlebinae**.

Genus **Icerya** Signoret.

Icerya subandina Leonardi.

Specimens readily recognizable as this species are present, collected on *Bulnesia retama* (Zygophyllaceae); Cordillera de Mendoza, Feb. 8, 1909. (Jorg. No. 8.)

Subfamily **Coccinae**.

Genus **Lecanium** Burmeister.

Lecanium perinflatum Cockerell.

There is one lot of this species on *Cestrum paraguayi* (Solanaceae) collected at Buenos Aires, Feb., 1909 (Jorg. No. 25) among Sr. Jorgensen's specimens.

Lecanium viticis, new species.

Occurring on the twigs of the host, typically closely clustered.

Adult female.—Fully matured adult female normally strongly convex, approximating hemispherical; average size, length 3.25 mm., width 3 mm., height 3 mm., but quite variable and usually much distorted through crowding on the host twigs; body colors light reddish and yellowish brown, these variously intermingled and often irregularly mottled with black; upper surface of body more or less shining, usually smooth in the discal area but with the margins strongly wrinkled and rugose and the intermediate area often pitted; anal cleft distinct, its margins reflexed; derm retaining most of its yellow-brown color after treatment with potassium hydroxide and showing small "pores" much as in the North American species, these "pores" mostly widely separated, but much more abundant and sometimes tending to cluster along the body margin and in a narrow median band extending anteriorly from the anal plates, in this last respect resembling *L. prunastr* (Fonsc.) except that the pores in the band are much fewer in number and distinctly less crowded than in *prunastr*; antennae small but elongate, at most indistinctly 5-segmented, the total length of one about 214μ ; legs also small but not reduced, length of a posterior leg about 535μ ; tarsal digitules slender, knobbed, those of claw stouter, swollen towards apices, these last extending well beyond the tip of the stout, curved claw; true dorsal pores and ducts largely obscured through the chitinization of the derm but probably with nearly, if not all, of the clear "pores" in the derm with tubular ducts in their centers; with a few quinquelocular disk pores ventrally between each spiracle and the body margin and with a number of much larger multilocular disk pores, each having 10-12 loculi, beneath and around the anal plates; no setae observed dorsally excepting only a submarginal row close to and paralleling the row of marginal setae; these marginal setae large and stout as compared with those of the North American forms, length varying considerably, the maximum about 32μ ; spiracular spines fairly stout, in threes, the median much the longest, about 64μ , the two laterals often unequal, averaging about 21μ ; each anal plate rather broad triangular, length about 178μ ; width about 107μ ; the anterio-lateral margin longer than the postero-lateral, and the latter thickened and vertically incised at about its middle, each plate bearing two dorsal setae close to the apex, a single seta at the margin of the apex and three or four ventral ridge setae spaced about equidistant; with two fringe setae on each side, the outer about twice the length of the inner, placed well within the anterior end of the ventral ridge, the inner fairly close to the middle line and approximating the position of the upper hypopygial setae in those species possessing these structures; anal ring approximately circular, not particularly stout, cellular and with six setae.

Larva.—As mounted, rather elongate oval, length 464μ ; width 250μ ; antennae rather long and slender, 6-segmented, the measurements of one in microns as follows: I, 18; II, 14; III, 39; IV, 29; V, 25; VI, 46; each segment beyond the second bearing a long curved spine and one or more setae of various lengths and sizes of which the longest approaches the length of the antenna; legs not unusual, bearing several long hairs, apparently with only a single long thread-like tarsal digitule extending beyond the tip of the claw on each leg, one claw digitule slender, thread-like, the other knobbed at apex; body dorsally with a marginal, a submedian, and on the thorax, an intermediate series of large and conspicuous double or 8-shaped pores on each half, these resembling those occurring in the

larva of *Akermes bruneri* except for the slight but distinct invagination of the pores in the latter; with three or four quadrilocular disk pores between each spiracle and the body margin; marginal setae of moderate length, fairly stout, middle spiracular spine long and stout, often faintly swollen near apex, the two laterals very much shorter, more or less distinctly lanceolate, ventrally with a submedian and two submarginal rows of small setae at least in the posterior abdominal region; each anal plate elongate, slender, triangular, the upper surface appearing irregularly rugose, the inner face somewhat sinuate, with a long apical seta about three-fourths the length of the body, a much shorter subapical seta on each side of this, a single ventral ridge seta, a single fringe seta and two small acute teeth about the middle of the postero-lateral edge of each plate; anal ring cellular, bearing six setae, the upper two of which are somewhat smaller than the others.

This species has been described from seven mounted adults, several mounted larvae and some additional unmounted material, all collected by Sr. Jorgensen at Misiones, October, 1910, on *Vitex montevidensis* (Jorg. No. 322e).

The types are in the U. S. National Collection of Coccidae.

This species appears to differ strongly from the common North American forms in the development of the 8-shaped pores in the larva, but the adult female shows no correspondingly conspicuous evidence of differentiation.

Subfamily **Diaspinae**.

Genus **Leucaspis** Targioni.

Leucaspis pusilla Loew.

This species is represented in the collection by four lots of material from Buenos Aires, collected May, 1911, as follows: on *Pinus insignis* (No. 13); on *Pinus* sp. (No. 14); on *Pinus canadensis* (No. 15) and on *Pinus pinea* (No. 16). Figures showing the pygidia of the adult and preadult females are appended to facilitate recognition.

Genus **Aspidiotus** Bouché.

Aspidiotus hederæ (Vallot).

To the single record of this species in the previous paper should be added the following collections from Buenos Aires: May, 1911: on *Nerium oleander* (Jorg. No. 5); on *Acacia leptophylla* (Jorg. No. 6); on *Acacia melanoscylon* (Jorg. No. 9); on *Pittosporum undulatum* (Jorg. No. 18); on *Olea europea* (Jorg. No. 19); and from La Plata, May, 1911, on *Acacia lophanta* (No. ?).

Aspidiotus latastei Cockerell.

This species, originally described from Chile, is represented in the Jorgensen Collection by two lots of material, both from Buenos Aires, collected May, 1911, on *Euonymus japonica* (Jorg. No. 1) and on *Ficus benjamina* (Jorg. No. 2.). A figure of the

pygidium of the adult female which should assist in the recognition of the species, is included.

Genus *Chrysomphalus* Ashmead.

***Chrysomphalus aonidum* (Linn.)**

This very common and widespread species was found in two lots of material from Buenos Aires, collected in May, 1911, one on *Olea fragrans* (Jorg. No. 20), and the other on *Citrus aurantium* var. *dulce* (Jorg. No. 21).

***Chrysomphalus dictyospermi* var. *pinnulifera* (Mask.).**

As the status of this form is somewhat doubtful, and is at present the subject of some study on the part of coccidologists, the writer has followed Lizer¹ in giving Maskell's name to it. The record is based on a single collection from Buenos Aires, May, 1911, on *Citrus aurantium* var. *dulce* (Jorg. No. 21).

***Chrysomphalus paulistis* Hempel.**

This species was collected by Sr. Jorgensen at Buenos Aires, May, 1911, on *Ligustrum paniculata* (Jorg. No. 4) and on *Laurus nobilis* (Jorg. No. 7). It has already been recorded from Argentina and has been figured by Lizer.

EXPLANATION OF PLATE.

Fig. 1-7, incl.—*Lecanium viticis*, new species.—1. larva, outline dorsal and ventral, X 80; 2. same; marginal and spiracular spines, X 360; 3. adult female, marginal seta, X 360; 4. same, antenna, X 80; 5. same, leg, X 80; 6. same, marginal and spiracular spines, X 153; 7. same, anal plates, X 153.

Fig. 8, 9. *Leucaspis pusilla* Loew.—8. pygidium of preadult female X 230; 9. pygidium of adult female, with additional figures showing variation in marginal fringe, X 230.

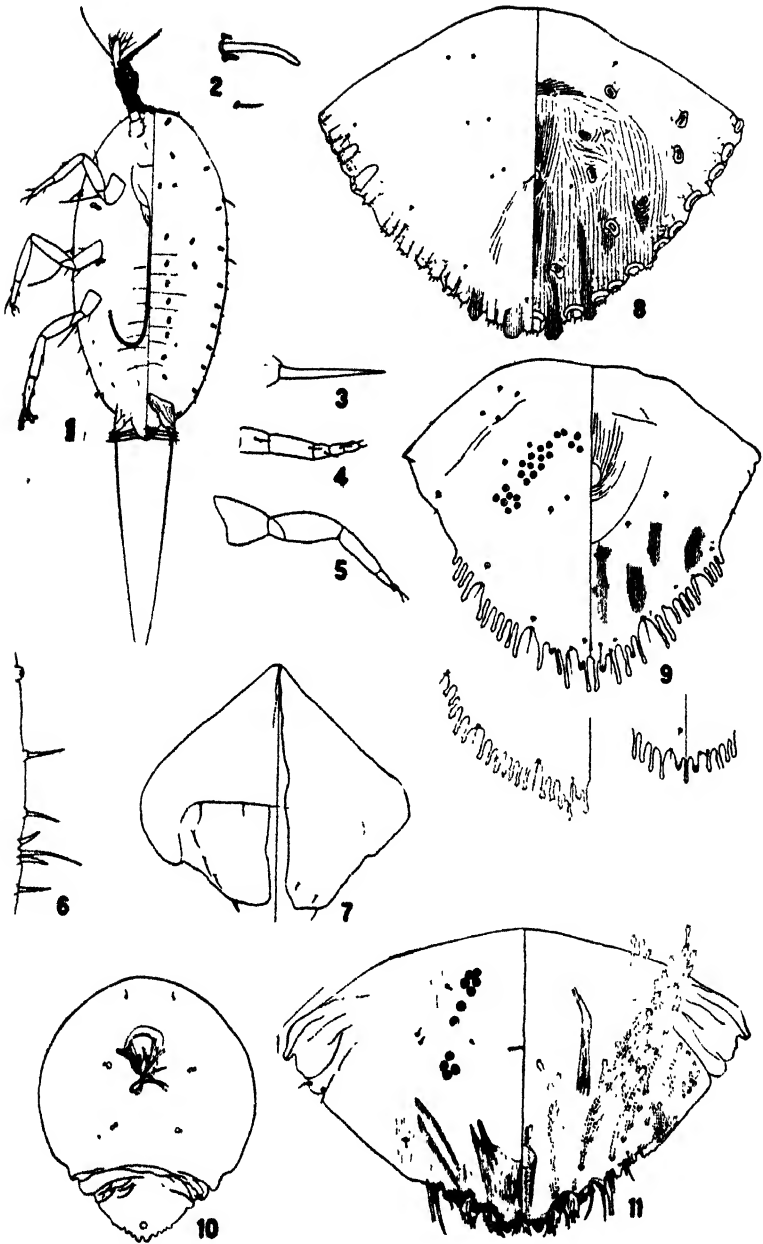
Fig. 10, 11. *Aspidiotus lataster* Ckll. 10. adult female, outline of body, X 40; 11. same, pygidium, X 153.

THREE NEW TERMITES FROM THE CANAL ZONE, PANAMA.

By THOMAS E. SNYDER, *Bureau of Entomology.*

In recent papers, as yet unpublished, the habits of 22 species of termites from the Canal Zone and nearby portions of the Republic of Panama have been described by the writer in collaboration with Messrs. H. F. Dietz and J. Zetek. Most of

¹Physis, Comunicaciones. No. 10 t. II. p. 177, Feb., 1916.



MORRISON—ARGENTINE COCCIDAE.

the collections have been made incidentally in connection with other duties by Messrs. Dietz, Zetek and I. Molino while stationed in the Canal Zone, in the employ of the Bureau of Entomology.

Dr. W. M. Wheeler is now at Panama and with Messrs. Zetek and Molino has explored some of the small islands with virgin flora and other little disturbed sections; three new termites have been found, making a total of 25 species for Panama. Two new species were found on Barro Colorado Island, C. Z., near Frijoles, C. Z., on March 20, 1923, and one new species at Frijoles, C. Z., on March 28, 1923.

Dudley and Beaumont in 1889 and 1890 published papers on their observations of the termites of the Isthmus of Panama. Unfortunately the biological notes were not correlated with specimens of the termites. Large mounds or nests made by "*Termes columnar*" over 5 feet in diameter at the base and nearly 4 feet high, at Ceyroyal Station of the Panama Railroad (on the Pacific Slope), have never been rediscovered or the identity of the termite that made them determined.

Doubtless when the outlying districts of Panama are carefully explored, other new termites will be discovered. Panama is an ideal location for a tropical research station for biological study.

Although of relatively small area, 14 genera of termites occur at Panama, represented by 25 species. Some of the species of *Leucotermes*, *Coptotermes* and *Nasutitermes* are extremely destructive to both living crops, timbers and other woodwork of buildings.

While in the United States there are 11 genera of termites and 40 species, termites are not as abundant in the temperate United States as in tropical Panama.

The three new species collected at Panama by Dr. Wheeler and Messrs. Zetek and Molino are *Mirotermes panamaensis* Snyder, *Orthognathotermes wheeleri* Snyder and *Anoplotermes parvus* Snyder.

Species of *Mirotermes* Wasmann are widely distributed throughout the southern hemisphere and also occur in Central America. At Panama the species *M. hispaniolae* Banks also occurs.

Species of the genus *Orthognathotermes* Holmgren are restricted to America. Only 3 species have been described and they are all from South America. The new species from Panama is the first record of this genus from Central America and I have taken pleasure in naming it after Dr. W. M. Wheeler.

Twelve species of *Anoplotermes* Fritz Müller have been described from America, two species only have been found at Panama—*A. gracilis* Snyder on the Pacific Slope and the new species *A. parvus* Snyder on the Atlantic Slope; small mound

nests are constructed by the latter species in Panama, while the former lives in the ground.

Mirotermes panamaensis, new species.

Soldier.—Head pale yellow, darker (yellow-brown) near anterior margin, sides nearly parallel, slightly wider anteriorly, anterior process larger than in *nigritus* Silvestri, with dense long hairs; head more robust (higher) than *nigritus*, with few scattered long and short hairs.

Labrum yellow, elongate, with two lateral, narrow, elongate lobes, concave in center, with long hairs.

Mandibles black, elongate, slender, bowed, incurved at apex.

Antennae yellow-brown, 14 segments, pubescent; third segment shorter than second, slightly longer than fourth; from fifth on segments become longer and wider towards apex; last segment elongate, narrow and pointed at tip.

Pronotum white with tinge of yellow, saddle-shaped, slightly emarginate anteriorly, with long hairs.

Legs white with tinge of yellow, claws brown, elongate, slender, pubescent.

Abdomen dirty grey-white with tinge of yellow, with dense short hairs and also a row of long hairs on tergites, latter at base of tergites.

Measurements: Length of entire soldier, 5.1-5.6 mm.; length of head with mandibles, 2.90-3.3 mm.; length of head without mandibles (to anterior), 1.50 mm.; length of left mandible, 1.80 mm.; length of pronotum, 0.30 mm.; length of hind tibia, 0.85 mm.; width of head (at widest portion), 0.90-0.95 mm.; width of pronotum, 0.60 mm.

Larger, with head lighter colored and more robust than in *nigritus* Silvestri, mandibles longer.

Type locality.—Barro Colorado Island, C. Z., Panama.

Described from a series of soldiers collected with workers by Wheeler and Zetek at the type locality, on March 20, 1923. Barro Colorado Island is in Gatun Lake, 1½ miles from Frijoles on the Atlantic Coast. In lower portion of termitarium of *Anoplotermes parvus* Snyder.

Type, soldier.—Cat. No. 26257, U. S. N. M.

Orthognathotermes wheeleri, new species.

Soldier.—(Plate 1, fig. 1). Head yellow posteriorly, darker (yellow-brown) anteriorly, widest posteriorly, tapers slightly anteriorly, narrower than the head of *O. macrocephalus* Holmgren; upper borders of antennal sockets prolonged into flattened tubercles or projections; these tubercles are narrower than in *macrocephalus*. Head with white, slightly raised eye spots posteriorly to the tubercles, more prominent and closer together than in *macrocephalus*. Trace of frontal gland. Head with few scattered long and short hairs.

Labrum yellow-brown, slightly broader than long, weakly 3 lobed, central lobe largest, roundedly projecting, with long hairs.

Mandibles black, bases with reddish tinge, long, bowed in the middle, with a marginal tooth at the bend; strongly incurved at tips; denticulations on margins of left mandible near base more prominent than in *macrocephalus*.

Antennae yellow-brown, 15 segments, pubescent; third segment shorter than second or fourth; from fifth segment on segments become wider and longer; towards apex, however, segments become shorter and narrower.

Pronotum yellowish, saddle-shaped, anterior margin emarginate, with dense long hairs.

Legs white with tinge of yellow, claws brown, legs elongate, slender, pubescent.

Abdomen dirty white, with dense long hairs.

Measurements: Length of entire soldier, 8.5 mm.; length of head with mandibles, 4.9-5.0 mm.; length of head without mandibles (to tip labrum), 3.0 mm.; length of head without mandibles (to anterior), 2.4-2.5 mm.; length of left mandible, 2.5 mm.; length of pronotum, 0.4 mm.; length of hind tibia, 1.4 mm.; width of head (at widest portion), 1.8-1.9 mm.; width of pronotum, 1.1-1.2 mm.

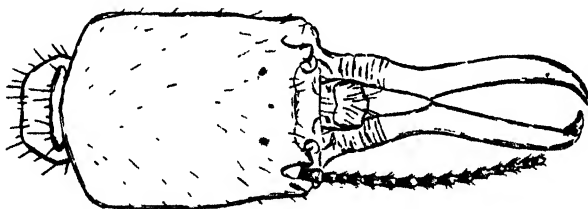


Fig. 1. *Orthognathotermes wheeleri* Snyder. Soldier dorsal view of head and pronotum. Drawn by Miss F. T. Armstrong.

Most closely related to *O. macrocephalus* Holmgren of Bolivia; named in honor of Dr. W. M. Wheeler.

Type locality.—Barro Colorado Island, C. Z., Panama.

Described from three soldiers collected with workers by Wheeler and Zetek at the type locality, on March 20, 1923. Barro Colorado Island is 1½ miles from Frijoles on the Atlantic Coast. In termitarium in earth; there was no definite structure above ground.

Type, soldier.—Cat. No. 26258, U. S. N. M.

Anoplotermes parvus, new species.

Winged adult.—Head greyish-black, slightly longer than broad, broadest at eye, broader than pronotum, rounded posteriorly, with dense long hairs, fontanelle small, indistinct, linear spot in depression, nearer posterior margin of head than in *A. gracilis* Snyder. Post-clypeus grey, nearly three times as broad as long, shorter than in *gracilis*, not greatly projecting, posterior margin deeply concave, with long hairs. Labrum yellow, tongue-shaped, broadest near base, with long hairs, extends to tip of mandibles. Mandibles yellow castaneous-brown at tips, short.

Eyes purplish-black, large, projecting, very near lateral margin head, much closer to anterior of head than to posterior. Ocelli large, elongate, with pro-

jecting upper rim, separated from compound eye by distance less than their short diameter, placed obliquely to eye.

Antennae grey-brown, 15 segments, pubescent; third segment very small, half length of fourth segment; fourth segment half length of second; segments become broader and longer towards apex; last segment conical.

Pronotum grey-brown, not twice as broad as long, broadest anteriorly, somewhat semi-circular in shape, shorter than in *gracilis*, anterior and posterior margins nearly straight, with long hairs.

Meso- and meta-nota grey-brown, posterior margins emarginate, pubescent.

Wings dark, margins ciliate, surface with hairs; fore wing median nearer to cubitus than to sub-costa, branched to apex, cubitus does not reach apex, 6 branches to lower margin.

Legs grey-brown, elongate, slender, pubescent.

Abdomen grey, with dense long hairs.

Measurements: Length of entire winged adult, 6.75-7.50 mm.; length of entire deâlated adult, 4.50-5.0 mm.; length of head (to tip of labrum), 0.77-0.85 mm.; length of left mandible, 0.37 mm.; length of pronotum, 0.32-0.35 mm.; length of hind tibia, 0.70 mm.; length of anterior wing, 5.5-5.75 mm.; length of wing scale, 0.32 mm.; diameter of eye (long diam.), 0.17-0.20 mm.; width of head (at widest portion), 0.65-0.70 mm.; width of pronotum, 0.60-0.65 mm.; width of anterior wing, 1.55 mm.; length of queen, 13.0 mm.; width of queen, 2.80 mm.

Darker colored and smaller than *A. gracilis* Snyder, also of Panama; the queen and male are lighter colored (more brown) than the winged adults.

Type locality.—Frijoles, C. Z., Panama.

Described from a series of male and female winged adults collected with workers at the type locality by Dr. W. M. Wheeler and Mr. I. Molino, on March 28, 1923. One first form queen and male found together in a cell in the termitarium on the ground. The termitarium was of soft, black earth-like substance, at the base of a tree.

Type, winged male adult.—Cat. No. 26259, U. S. N. M.

NOTES ON THE DISTRIBUTION AND HABITS OF NORTH AMERICAN PHYLLOTRETA (COLEOP.).

By F. H. CHITTENDEN.

The flea-beetles of the genus *Phyllotreta* inhabiting America, north of Mexico attract periodical attention by their ravages, and the Bureau of Entomology has given them some study in recent years in regard to their occurrence on cruciferous crop plants. The late H. O. Marsh studied particularly the forms occurring in Colorado; M. M. High devoted some attention to those occurring in Mississippi and Texas, and certain economic species which occur in Louisiana, the District of Columbia and elsewhere have been studied and are still the subject of research.

As a result, considerable material has accumulated, and in order to bring available data into shape for the benefit of entomologists who may be interested, it has been deemed desirable to furnish this matter briefly in the present paper.

***Phyllotreta zimmermanni* Crotch. (Fig. 3.)**

Orchestris zimmermanni Cr., Proc. Acad. Sci. Phila., 1873, p. 66.

Phyllotreta (Haltica) sinuata (nec Steph. et auct.) Horn, G. H., Trans. Amer. Ent. Soc. vol. XVI, p. 295, pl. VI, fig. 15, 1889; Riley, C. V., Rept. Comm. Agr. f. 1884 (1885), pp. 305, 306.

Phyllotreta zimmermanni Cr., Heikertinger, Franz, Verhandl. Zool.-bot. Gesells., Wien. 1911, vol. LXI, pp. 12, 13, 19, fig. 7.

According to Heikertinger (l. c.) the *Haltica sinuata* of Stephens described in 1831 (Ills. Brit. Ent. Mand., Vol. IV, p. 297), is not the American species described by Crotch as *Orchestris zimmermanni*. Crotch's form is native to North America, Stephens' is European and Asiatic and is not known to occur in this country. The original description follows:

"Very close to *O. lepidula*, but the elytral vitta is deeply excavate outside, straight at the base and incurved at the apex; base of tibiae pale. L. .10 Missouri (Riley).

♂ fifth joint of antennae very large, elongate quadrate."

The fourth and fifth antennal joints are black and closely jointed. In the male the fifth is convex on the upper and concave on the lower surface, being thus strongly bowed, a character which separates it from all other native species which the writer has studied.

The distribution in America is credited from New England to Georgia, Missouri and Michigan. Specimens examined from Bloomington, Ill.; St. Louis and Charleston, Mo.; Knox, Independence, Ind.; Rosslyn, Arlington, Va.; Washington, D. C.; Berwyn, Md.; Chadbourn, N. C.; Omaha, Nebr.; Iowa City, Iowa; Baldwin, Topeka, Kans.; Madison, Green Bay, Wis.; St. Anne, Quebec, Canada; Bandon, Manitoba. Taken at Breckinridge, Colo., June 15, 1896, by Professor Wickham at an elevation of 9,600-10,000 feet.

Ph. zimmermanni, although not especially abundant in collections seen, may be easily taken in numbers if search is made on its wild food plants. It has been recorded on *Lepidium* and *Arabis* and the larva is a leaf-miner, in which respect it differs from *vittata*, which is a root-feeder. It had confined itself apparently to wild plants until recent years. In 1913 and 1914 the larva was observed by Mr. E. Melville Duporte¹ mining the leaves of cress and the beetles feeding on the foliage of radish, turnip and cabbage at Quebec, Canada. The cress was practi-

¹Canadian Entomologist, Vol. XLVI, p. 433.

cally destroyed by the beetle and its larva. During May, 1919, the species was reported on cabbage, radish and horse-radish at Madison, Wis., by Mr. L. G. Gentner, Bureau of Entomology, and in the District of Columbia the larva is found during the summer breeding freely on wild peppergrass (*Lepidium virginica*), the beetles attacking no other plants when peppergrass is available.

June 28, 1920, this species in company with *Ph. vittata* was found to have completely destroyed an entire planting of mustard, representing an experiment at Arlington, Va. Only a few plants remained at one end of the plot and a still smaller number at the other end, all others having been eaten to the ground. It was somewhat more abundant than *Ph. vittata* at this time.

This is the first instance known to the writer of injury by this species in this vicinity.

***Phyllotreta vittata* Fab. (Fig. 1.)**

In Fall's list of Coleoptera of Southern California¹ the statement is made that specimens referred to this species "have been taken on two occasions at Pomona." In Fessig's "Injurious and Beneficial Insects of California" (pp. 282, 283), mention is made on the authority of Messrs. Fall and Van Dyke, of its occurrence in California, although *Ph. ramosa* Crotch is the prevalent species and the two have been confused.

The writer has seen a series of this species from Huntington Beach, Cal., July 25, 1916, Los Gatos, Cal. (Hubbard & Schwarz), specimens labeled California without exact localities and Corvallis, Ore. The identification of *vittata* from the Pacific Coast, and the fact that it does not occur in the Rocky Mountain region, so far as can be determined, is additional proof, in the writer's opinion, that it has been introduced from the Old World, since it has been shown by Heikertinger² that it is of Eur-Asian origin and common to both continents. As the species was recognized in America many years ago (described from "Carolina" in 1801), its diffusion westward was rapid, but it has evidently found its way to the Pacific States either by a "commercial jump" or has been introduced independently from the Eastern continent. This would be a matter easy of accomplishment in potted roots of any of its various larval food plants.

***Phyllotreta vittata discedens* Weise. (Fig. 2.)**

Weise, Naturg. Ins. Deutsch, pt. I, vol. 6, 1893, pp. 873, 874.

Elytra each with two large irregular yellow spots; humeral basal spot not extending to lateral margin or touching the base, incurving basally toward the

¹Cal. Acad. of Sci., vol. VII, 1901, p. 159.

²Die Kafer des Deutschen Reiches, vol. IV, 1913, pp. 174, 175, fig. 20.

elytral suture; subapical spot narrow, subreniform or crescentic, incurved apically toward the elytral suture. Antennae with first three joints honey yellow, but sometimes darker. Male characters as in *vittata*.

Length: 2 mm., width, 0.8 mm.

San Antonio, Tex., January 12, 1910 (H. O. Marsh); Cuero, Tex., June 28, 1910 (M. M. High); Baton Rouge, La. (T. H. Jones and T. H. Cutrer); Crystal Springs, Miss. (M. M. High); Orlando, Fla., May 13, 1907 (H. M. Russell).

Found feeding on turnip, cabbage and some other cultivated crucifers in these localities.

This variant is a little smaller than *bipustulata*, which it closely resembles in coloration and punctation, distinctly differing in the antennal structure of the male. It is, indeed, generally confused with *bipustulata* in collections and it is somewhat surprising considering the fact that this variation was described as early as 1893, that American coleopterists have not recognized it. It is evidently a southern form, not occurring north of the Gulf States, as far as can be learned, while typical *vittata* Fab. is extremely rare in the South.

Examples of *vittata* may be found frequently from all parts of the country in which the central portion of the vittae is nearly obliterated.

***Phyllotreta undulata* Kutsch.**

Haltica undulata Kutsch, Wien. Entom. Monatschrift, 1860, p. 301.

Elongate oval, moderately convex, moderately shining black, feebly aeneous; elytral vitta broad, yellow, slightly incurved at base, subparallel on sutural margin to near apex, thence recurved toward but not reaching the suture, antennae about half as long as body, opaque black, 2 or 3 basal joints wholly or in part testaceous. Head punctate about as in *vittata*. Elytra distinctly wider at base than prothorax, humeri not prominent, punctures of disc as in *vittata* but with somewhat less tendency to stria arrangement; vitta slightly wider in basal fifth without subhumeral branch, narrower and subparallel in middle three-fifths, wider in apical fifth. Ventral surface including femora black, tibiae and tarsi more or less testaceous.

♀ Last ventral simple. Fifth joint of antennae very little longer than fourth or sixth, sixth shorter than seventh.

Length 1.8 mm.; width 0.8 mm.

Bladensburg, Md. (A. B. Duckett).

As will be noted from the description, this species closely resembles *vittata* Fab. in many particulars. It is a little smaller and more slender and differs markedly in the subparallel elytral vitta, which divides each elytron into three subequal parts, one yellow and two black. The 5th antennal joint in the female is scarcely one-fourth longer than the 4th while in *vittata* it is fully one-half longer than in 4th. The elytral vitta in preserved specimens is dull yellow.

Phyllotreta liebecki Schaeffer. (Fig. 4.)

Phyllotreta liebecki Schaeffer, Jour. N. Y. Ent. Soc., Vol. XXVII, 1919, p. 439.

Columbus, Tex., May 20-June 3, Jacksonville, Fla. (Coll. Hubbard & Schwarz); Baton Rouge, La., January 18-May 2, 1919 (T. H. Cutrer).

This species is distinguishable from *Ph. vittata*, which it resembles in outline and in punctuation, by the male antennae, particularly the much shorter fourth and wider fifth joint, by the elytral vitta incurving to the suture, as also by the paler legs.

Specimens have been collected by Mr. Cutrer at Baton Rouge, La., on mustard, radish and Chinese cabbage or pe-tsai and the larva has been reared from mines in the leaves of *Lepidium virginicum*.

Mr. Charles E. Smith, Bureau of Entomology, wrote in 1921 and 1922 that he had found this species breeding extensively as a miner in the foliage of *Radicula walteri* and *obtusata* and *Arabis virginica* at Baton Rouge, La.

Phyllotreta oregonensis Crotch.

This species may be distinguished from all described forms by the broad dark yellow or brown vitta of the elytra and by the antennal joints of the male. The fourth joint is nearly as wide as the fifth and about two-thirds as long. The elytral vitta is subject to considerable variation in width. It is one of our largest species and shows unusual variation in size, measuring from 1.8 to 3.0 mm. in length.

Reported by Prof. F. G. Titus, June 14, 1904, at Paonia and Fowler, Colo., feeding on leaves, seed-heads and flowers of sugar beet, on foliage and flowers of peppergrass, *Lepidium (scopulorum) spatulatum* and on *Cleome serrulatum*. The leaves of these weeds were extensively mined by the larvae, which were reared to adult July 8. June 15 to August 26, 1915, Marsh observed this species at Rocky Ford, Colo., feeding on radish, turnip and marsh cress (*Radicula palustris*). Specimens also from Fort Collins and Montrose, Colo.; Laramie, Wyo.; Utah; Childress, Tex. (on turnip); Garden City, Kans. (on turnip).

Phyllotreta bipustulata Fab.

The distribution accorded this species by the writer in an article published in 1902¹ is correct with the exception of the last two localities "South Carolina and Columbus, Texas," which prove to be represented by another insect, *Ph. vittata* var. *discedens* Weise. To that list may be added, Rochester, N. Y.; Knox, Ind.; Muscatine, Iowa City, and Independence, Iowa; Bloomington, Ill.; Madison, Wis.; Riverdale, College

¹Bul. 38 N. S., Div. Ent., U. S. Dept. Agri., p. 78.

Park, and Berwyn, Md., Washington, D. C., and Rosslyn, Va.

Blatchley writes¹ of its occurrence in Indiana "throughout the State, frequent; more so in the southern counties."

The food habits are similar to those of *vittata*, which probably applies also to the larvae, although the species has not been reared. With little doubt it is a root feeder. The beetles which were extremely rare at College Park, Md., during 1919, occurred in great abundance during May, 1920, in about equal numbers on yellow rocket (*Barbarea barbarea*) and marsh cress (*Radicula palustris*). This occurrence in such numbers is strongly suggestive of these plants being employed as larval food plants and a search should be made for larvae at the roots. It was also in abundance at Arlington, Va., the last week of March, 1921, outnumbering at this time *Ph. vittata* and *Ph. zimmermanni* on horse-radish and wild cress.

***Phyllotreta aeneicollis* Crotch.**

Described from Texas and stated by Crotch also to occur in "middle and southern States" and by Horn to occur also in Kansas. Crotch's remarks require amplification. From available material this species has a limited range, Rocky Ford, Colo., being the most northern locality, Baton Rouge and Berwick, La., being the most eastern. It occurs south to Brownsville, Tex., and is fairly common in the States mentioned, also recorded from Cloudcroft, N. Mex. (Cockerell and Fall).

Typical specimens from Texas and Louisiana are brown aeneous, although green individuals are not uncommon. Colorado specimens are occasionally green but most specimens have a distinct blue lustre and less seldom purplish.

Reported on turnip and cabbage in Colorado and injurious to the foliage of mustard and turnip in gardens in Louisiana. The larva is a leaf-miner on *Lepidium virginicum* and *Coronopus didymus*, according to the observations of Messrs. T. H. Jones, T. H. Cutrer, and Chas. E. Smith.

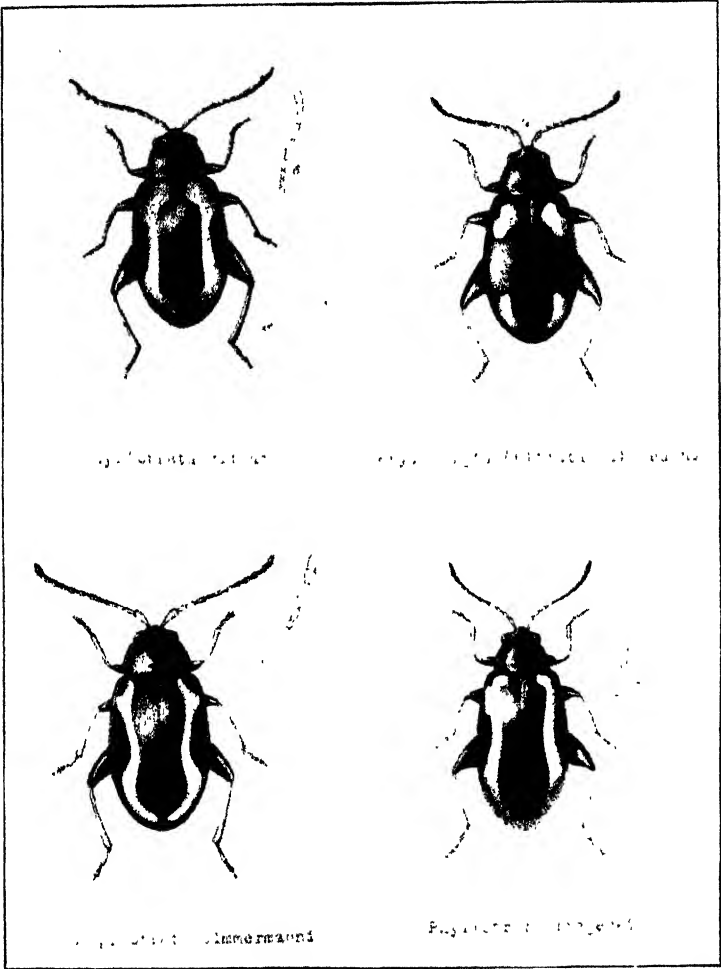
***Phyllotreta pusilla* Horn.**

Since this species has been treated in detail in Bulletin 902, U. S. Department of Agriculture,² only a few facts need be added.

The distribution is the region of the Rocky Mountain plateau, ranging from the Boreal Zone in Montana southward to the semitropical region of south Texas in the United States, west-

¹Cat. Coleoptera or Beetles Known to Occur in Indiana, 1910, p. 1198.

²The Western Cabbage Flea-Beetle, by F. H. Chittenden and H. O. Marsh, October 22, 1920, pp. 1-21.



CHITTENDEN NORTH AMERICAN PHYLLOTRETA

ward to the Pacific Coast of California and includes Mexico, in which country it is probably native, although introduced into the United States many years ago.

The occurrence of this species in Mexico has always been in doubt, hence not well defined. During 1922, Mr. E. G. Smyth, Bureau of Entomology, collected specimens at Cuernavaca, October 21, on radish which differ in nowise from the specimens occurring in the United States. This point is about 4,500 miles south of Brownsville, Tex., the southernmost limit of the species in the United States. It does not appear to flourish so well in the lower latitudes.

The beetle has been recorded as attacking practically all the Cruciferae occurring in its habitat and is a pest on beets, lettuce, beans, peas, carrots, tomato, potato and corn. The larva develops in the roots of several of the cruciferous plants, as also on Cleome.

***Phyllotreta armoraciae* Koch.**

Since the publication of the known distribution of this species in the United States,¹ a number of new localities have been reported as follows: Guelph, Ottawa, Toronto, Ontario, Can.; Montreal, Ironside, Outremont, Quebec, Can.; Melrose Islands, Mass.; Newark, Brookdale, Richfield, New Brunswick, N. J.; Mineola, L. I., N. Y.; Butler, Glensboro, State College, Pa.; Plymouth, Ind.; Muscatine, Iowa; Sturgeon Bay, Wis.

***Phyllotreta lewisii* Crotch.**

The distribution accorded by Horn is "Colorado, Illinois (Crotch), Texas, Nevada and adjacent regions of California." Specimens have also been seen from Rocky Ford, Fort Collins, Greeley, Longmont, Pleasant Valley, Colorado Springs, Denver, Colo.; Williams, Flagstaff, Winslow, Ariz.; Gallup, N. Mex.; Salt Lake City, Utah; Dallas, Ore.; Cheyenne, Wyo.; Wellington, Kans.; Lafayette, Ind.; Iowa City, Ia., Cypress Mills, Tex., and Bladensburg, Md. The last locality may be an accidental occurrence, as only a single specimen is represented.

Specimens were collected by Titus on sugar beet and alfalfa in different regions of Colorado and Utah, as also on Cleome and "skunk-weed." At Rocky Ford, Colo., Marsh collected beetles on *Cleome serrulata* and obtained the larva on the roots of this weed.

¹Bul. 535, U. S. Dept. of Agr., p. 5, by Chittenden and Howard.

THE LARVA AND PUPA OF MICRODON MEGALOGASTER SNOW. (DIPTERA.)

BY CHARLES T. GREENE, *Bureau of Entomology.*

While collecting on May 5, 1922, three and one-half miles west of Falls Church, Virginia, the writer found a nest of the ant *Formica fusca* subspecies *subsericea* Say.¹ A careful examination revealed two larvae of *Microdon megalogaster* Snow and five empty pupae cases from last year. The material is in the collection of the United States National Museum.

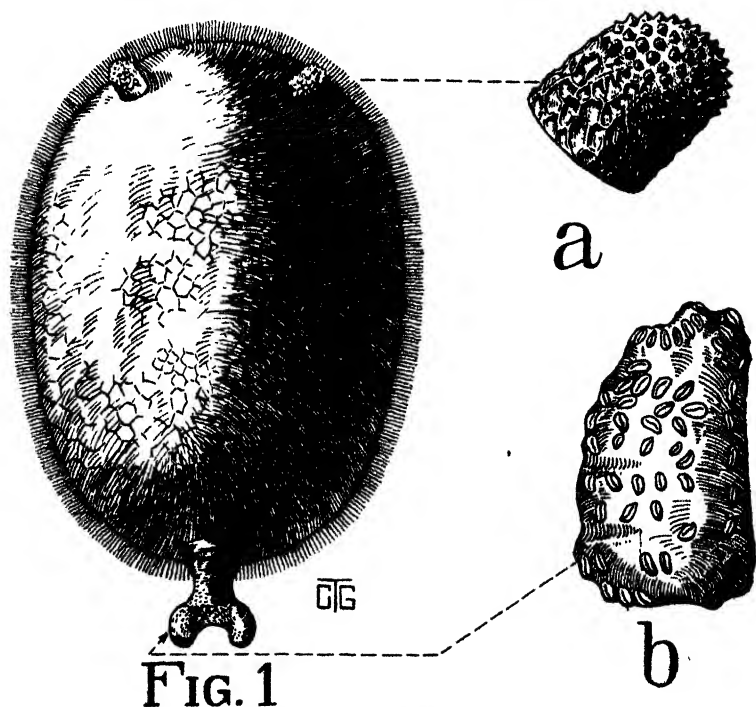


FIG. 1

***Microdon megalogaster* Snow.**

Fig. 1, a, b.

Larva.—Large, dull, brownish red with the surface faintly reticulate; about three-fourths as wide as long and the height nearly equal to the width; on the lateral edge are two rows, one above the other, of crinkly, bristle like, reddish yellow hairs which entirely encircle the larva. Anterior spiracles wanting. Posterior spiracles prominent and forked at the apex, located just above the lateral edge, where the dorsum and venter meet; they are round with concave sides, the smaller diameter in the middle; they are located on a circular elevation, only slightly raised above the surface; where the spiracles join this elevation there

¹Determination by Dr. W. M. Mann.

is a row of small, sharp ridges encircling the spiracles, these ridges resemble the teeth in a cog or ratchet; the body of the spiracles is a dull, brownish yellow with fine red lines or dashes transversely; underneath the brownish yellow surface the surface is reddish black and finely reticulate; transversely across the apex the small red dashes are much broader and more prominent; the stigmal plates are reddish yellow, shining, much wider at the base than the apex; they are separated by a space a little more than the width of one plate; there are numerous, small, elliptical ridges or elevations along the upper surface of each is a longitudinal slit; the ridges are scattered over the surface of the stigmal plate (see drawing, Fig. 1-b). Venter deep reddish.

Pupa.—Like the larva with the following exceptions. Color is slightly darker; anterior spiracles appeared and are located about half way between the venter and the dorsum and at about the apical sixth; separated by a space about equal to four times the height of one spiracle; height of each spiracle about equal to one and one-half times the diameter; spiracles are cylindrical, dark red and deeply reticulate on the sides; apical surface a little more yellowish and with numerous close set cone shaped tubercles. (See drawing, Fig. 1-a.)

Length 10.5 mm.; width 8 mm.; height 5.75 mm.

Description from two specimens collected and reared by the writer. Larvae collected May 5, 1922, pupated May 6 and two adults emerged May 17, 1922.

DISTRIBUTION RECORD ON *MACRONOCTUA ONUSTA* GROTE. (LEPIDOPTERA.)

By C. C. HAMEL, *Bureau of Entomology.*

While thinning out my twelve year old bed of Iris (*Iris germanica* Linn.) on July 1, 1922, at Amherst, Lorain County, Ohio, two small patches were noticed in which the leaves had become a blackish color, drooping and very slimy to the touch. At the base of the leaves, close to the rootstalks, there were holes from which hung a brownish-colored frass held together by webbing. Upon cutting open the stalk there was found a whitish translucent larva approximately 20 mm. in length with a brown head, and with black spots in lateral rows. This, upon being exposed to the sunlight, immediately attempted to escape and was captured only with difficulty. All the other rootstalks in the immediate vicinity were at once destroyed, but only two additional larvae were found. The tunnels did not extend into the rootstalks but were confined to the base of the leaves. As it was feared that this might be the larvae of the dreaded European corn borer (*Pyrausta nubilalis* Hubn) the specimens were submitted to Mr. Carl Heinrich of the U. S. National Museum, who determined them as *Macronoctua onusta* Grote. No previous record of the occurrence of this insect in Ohio could be found by the writer in the literature thereon.

NON-HUMAN HOST RECORDS OF WOHLFAHRTIA (DIPTERA).

BY R. C. SHANNON, *Bureau of Entomology.*

Wohlfahrtia magnifica Ports. is a common parasite of man and domestic animals in Europe, particularly Russia. We have a number of records of our North American species, *W. vigil* Walker and *W. meigeni* Schiner, parasitizing man, usually infants, but to date we have no data regarding their other and more usual hosts. While at Ithaca, N. Y., during August, 1921, a young rabbit, which was heavily infested by maggots of *Wohlfahrtia vigil*, was brought to the writer by R. Harwood, who was able to easily capture it because of its badly crippled condition. The maggots had worked their way deep into the flesh in the region of the right shoulder, even penetrating well under the scapula. The rabbit died the next day but the larvae, about ten, which were well grown, made their way out of the body. The larvae pupated but adults did not emerge until a year later.

This species, rare in collections, is fairly abundant in favored localities about Ithaca and on bright sunny days the males can be found resting on the cement sidewalks. The past summer (1922) Dr. Johannsen and the writer collected about thirty-five specimens, all males but one, on sidewalks. Their season apparently lasts to the first frost.

Mr. C. T. Greene adds the following note: Two muscid larvae, received from the Bureau of Animal Industry for identification and which prove to be a species of *Wohlfahrtia*, either *vigil* or *meigenii* were taken at Dunkirk, Montana, September 8, 1922, from the back of an Airdale puppy six days old. These larvae were located close to the spine. At first there were noticed two small, white spots about the size of a pin's head. In a couple of days these spots developed into holes in which was secreted a yellow mucous fluid. About the fourth day the larvae were working their way out. The holes healed up rapidly and the puppy seems to be as normal as others of the litter.

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TINGITOIDEA OF THE VICINITY OF WASHINGTON, D. C.
(HETEROPTERA.)

By W. I. McAtee.

INTRODUCTION.

The Tingitoidea are insects characterized by reticulate sculpturing, and often also by cellulate membranous expansions of the integument, characters which justify the application of the name lace-bugs to them. Most of the common species of our area live on the under side of leaves, where they lay their dark, peg-like eggs, and where the spiny nymphs later complete their development. The feeding operations of the lace-bugs produce small pale spots on the upper surface of the leaves, which vary in number with the abundance of the insects; in cases of very heavy infestation the leaves are so damaged that they turn brown and curl up. Numerous kinds of lace-bugs are common, at least locally, and several of the species are restricted to but one or a very few kinds of food plants.

Collecting lace-bugs requires a combination of botanical and entomological acumen, and the process of looking for the food plant, and for specimens showing the work of these bugs is full of interest. Why certain kinds of plants, so few in proportion to our whole flora, have been settled on as hosts by the lace-bugs is a problem that would seem to defy solution.

In addition to the common species of lace-bugs attached to certain food plants there are in the family Tingitidae a considerable number of species that are rarely collected, the habits of which are unknown. The chance of encountering some of these forms and of adding to the stock of information about them should ever be borne in mind by the collector.

It has not been deemed necessary to include keys in the present paper, since keys to both genera and species may be found in the reports upon the Tingitoidea of Ohio and of New Jersey, and systematic treatment of individual genera in other articles cited in the bibliography. A comparative statement of the number of species of lace-bugs reported in the formal lists for Ohio, for New Jersey, and in the present list is given in the subjoined table. No doubt a number of species have been added to the Ohio list since 1916. A few species additional to those here listed should be collected in the vicinity of the District of Columbia. Among described species the following

may be suggested as likely to occur: *Acalypta thomsonii*, *Melanorhopala clavata*, *Corythaica bellula*, *Corythucha celtidis*, *Corythucha bellula* and *Teleonemia nigrina*, but in a family so recently studied intensively, the discovery of entirely unknown species is not at all improbable.

Species of Tingitoidea in Recent Lists.

	Ohio 1916	New Jersey 1922	District of Columbia 1923
Piesmidæ			
Piesma	1	1	1
Tingitidæ			
Acalypta	—	1	1
Drakella	1	—	—
Hesperotingis	—	1	1
Melanorhopala	1	1	1
Tingis	—	—	1
Physatocheila	1	2	3
Atheas	—	—	1
Leptoypha	—	1	2
Gelchossa	—	1	3
Gargaphia	2	2	3
Corythucha	11	11	13
Stephanitis	1	2	1
Leptobyrsa	—	—	1
	18	23	32

Those interested in the fauna of Plummer's Island, Md., can learn from the records cited or from the symbol P. I. at the end of specific accounts what species have been collected on the island. Forms collected in the immediate valley of the Potomac between Great Falls and Little Falls carry the symbol V. P. I. Thirteen species are in the former group, and 12 in the latter. Excluding synonyms 11 species of lace-bugs have been described wholly or in part from specimens collected in our region.

The preparation of the following list has been facilitated more by the work of Dr. Carl J. Drake than by any other factor. Dr. Drake not only has had a major part in working up the classification of our lace-bugs, but he has identified or verified the identification of a great proportion of the specimens upon which this list is based. He has also read the manuscript and made useful suggestions. The writer is indebted furthermore to Messrs. Nathan Banks and H. G. Barber for reading copies of the list and for supplying records of Tingitoidea collected by them in this locality.

Annotated List of Species.

Family **Piesmidæ.**

Genus **Piesma** LePeletier and Serville.

P. cinerea Say.—Abundant, and of general occurrence; the preferred food plant is lamb's-quarters (*Chenopodium album*); adults have been taken in winter, among old leaves, on the foliage of scrub pine (*Pinus virginiana*), and under bark of birch and cherry; season for non-hibernating individuals May 20 to September 6. V. P. I.

Family **Tingitidæ.**

Genus **Acalypta** Westwood.

A. lillianis Bueno.—Beltsville, Md., May 21, 1922, J. R. Malloch; Maryland near Plummer's Id., May 9, 1913, taken by sweeping in a meadow, McAtee; Washington, D. C., May 20, 1904, O. Heidemann. McAtee also took a specimen of *Acalypta* at Beltsville, hibernating in Sphagnum; this was in the possession of Mr. Heidemann at the time of his death, and its present location is unknown. Possibly it was *A. thomsonii*, known from similar situations not far south of here.

Genus **Hesperotingis** Parshley.

H. antennata Parshley.—Washington, D. C., July 3, 1918, J. G. Sanders.

Genus **Melanorhopala** Stal.

M. infuscata Parshley.—Falls Church, Va., July 15, 27, 30, Aug. 2, on bark of tulip-tree, N. Banks; Great Falls, Va., August 21, 1917, H. G. Barber; Scott's Run, Va., July 4, 1918; Dead Run, Va., June 10, 1922, on flowers of *Ceanothus americanus*, McAtee; Glen Echo, Md., July 10, 12, 1921, J. R. Malloch; Maryland near Plummer's Id., at tulip-tree sap, July 25, August 5, 1914, R. C. Shannon; Washington, D. C., July 4, 1895.

Genus **Tingis** Fabricius.

T. necopina Drake.—Bladensburg, Md., July 27, 1890 (Coll. P. R. Uhler).

Genus **Physatocheila** Fieber.

P. brevirostris Osborn and Drake.—Plummers Id., Md., May 21, 1905, E. A. Schwarz; Falls Church, Va., May 3, N. Banks.

P. major Osborn and Drake.—Plummer's Id., Md., June 7, 1914, October 12, 1913, McAtee; Falls Church, Va., Washington, D. C., no dates, N. Banks.

P. plexa Say.—Stubblefield Falls, Va., on hickory, July 4, 1918, October 30, 1921, on laurel (*Kalmia latifolia*). The latter specimens are of a uniform reddish-brown color (clear pinkish

red when alive), but I am convinced their color is but a concomitant of senescence, and their choice of a plant upon which to sit, perchance to feed, one of necessity, the hickory leaves having been long dried up, but the evergreen laurel being still in good condition. Dead Run to Turkey Run, Va., April 30, 1922, also a pink specimen (no doubt overwintered); Glencarlyn to mouth Four-mile Run, Va., September 27, 1914, McAtee.

Genus *Atheas* Champion.

A. insignis Heidemann.—Locally common on *Stylosanthes biflora*. Glen Echo, Md., August 22, 1922, H. G. Barber, J. R. Malloch, McAtee; Bladensburg, Md., July 21, 1890, O. Heidemann; Cabin John Bridge, Md., July 29, 1914, H. S. Barber; Washington, D. C., July 7, 1909, August 8, 1910, Forest Glen, June 13, 1913, O. Heidemann; Vienna, Va.; Rock Creek, D. C., August 24, N. Banks; August 8, 1913, H. G. Barber.

Genus *Leptopypha* Stal.

L. costata Parshley.—Marshall Hall, Md., August 1, 1891, N. Banks, July 2, 3, 1897, September 3, 1891; Mt. Vernon, Va., April 19, 1904, R. P. Currie; Virginia opposite the District of Columbia, June 15, 1902; Rock Creek, D. C., June 20, 1890; Washington, D. C., June 20, July 8, 28. These are the older records and include the specimens from which the species was described. From one or the other of these collections the impression was obtained that the food plant of the species was witch-hazel. The writer has beaten witch-hazel thoroughly at every opportunity without finding this insect and he believes the report cited is in error. On May 19, 1918, he collected one specimen at Dyke, Va., upon *Fraxinus caroliniana* which, considering the habits of *L. mutica*, is a more likely suggestion as to the true food plant. Dr. Carl J. Drake informs me he has taken this species in great numbers on ash.

L. mutica Say.—Abundant on fringe tree (*Chionanthus virginiana*) and upon ash (*Fraxinus* spp.). It appears as early as April 11 and has been collected as late as October 12; comes to light. P. I.

Genus *Gelchossa* Kirkaldy.

G. clitoriae Heideman.—Fairly common on *Clitoria mariana*, and feeds also on other leguminous plants such as various species of *Meibomia* and *Lespedeza*. Dates of collection range from June 26 to October 14; in copula July 26; eggs July 19; comes to light. P. I.

G. heidemannii Osborn and Drake.—Exceedingly abundant on wild indigo (*Baptisia tinctoria*); season May 2 to October 10. V. P. I.

G. oblonga Say.—Apparently quite local, but common on its food plant, *Falcata comosa*, if the right place be found. Glen Echo, Md., July 10 to August 22, J. R. Malloch, H. G. Barber, McAtee; Oct. 12, 1901, no collector; Maryland near Plummer's Id., July 26, McAtee; Chain Bridge, Va., June 5, N. Banks.

Genus *Gargaphia* Stal.

G. angulata Heidemann.—The food plant of this species is *Ceanothus americanus* upon which it is often found in abundance. Records: Great Falls, Va., May 19, May 23, July 25; Scott's Run, Va., July 4; Dunn-Loring, Va., August 30, McAtee; Glencarlyn, Va., July 1, 1906, D. H. Clemons; Vienna, Va., August 26, 1916, H. G. Barber.

G. solani Heidemann.—Occasionally found in numbers on its wild food plant *Solanum carolinense*. Records: Hyattsville, Md., Sept. 6; Hunting Creek, Va., Sept. 23; Glencarlyn to mouth of Four-mile Run, Va., Sept. 27, McAtee; Vienna, Va., August 30, 1916, H. G. Barber. The species is a pest to the cultivated egg plant and has been taken upon it near Washington by Dr. Carl J. Drake.

G. tiliae Walsh.—Common and widespread on the basswood (*Tilia americana*); hibernating adults have been taken under bark and among old leaves; on the subsidence of a flood, March 30, 1913, a number were taken from drift on Plummer's Id., Md., further evidence that the species winters in litter on the ground. Eggs May 18 and June 8, 17; records of adults on the food plant from April 3 to October 13; in copula April 25; comes to light.

Genus *Corythucha* Stal.

C. arcuata Say. Abundant on oaks; has been collected on the food plants from May 2 to November 21; eggs from May 30 to July 27, but in copula as late as September 27. Variety *mali* Gibson lacks a dark band across posterior part of tegmina. P. I.

C. associata Osborn and Drake.—Arlington Farm, Va., on wild cherry (*Prunus serotina*), June 24, 1922, J. E. Walter; Chain Bridge, Va., September 4, October 2, 1921, J. R. Malloch; Great Falls, Va., on peach leaves, September 5, 1916; Scott's Run to Ball's Hill, Va., August 12, 1917; Four-mile Run, Va., May 31, 1914, Plummer's Id., Md., July 27, September 1, 1913; Eastern Branch, near Benning, D. C., September 7, 1913, McAtee; Forest Glen, Md., May 18, 1914, July 27, 1913, O. Heidemann; Washington, D. C., July 16, September 3, N. Banks.

C. bulbosa Osborn and Drake.—Abundant on its sole food plant, the bladdernut (*Staphylea trifolia*), on which it has been collected from April 22 to September 14; eggs May 9 to July 13. P. I.

C. celtidis Osborn and Drake.—Has been taken at Hagerstown, Md., July 10, 1915, H. L. Parker; probably occurs nearer Washington.

C. ciliata Say.—Very abundant on sycamore (*Platanus occidentalis*), on the leaves of which it feeds and under the bark of which it chiefly winters; it has been collected in winter also among old leaves and on the foliage of scrub pine. Collected on snow Rock Creek Park, D. C., Dec. 25, 1908, F. E. Matthes. P. I.

C. coryli Osborn and Drake.—Common locally on hazel-nut (*Corylus americanus*); near corner of Conduit and Potomac Roads, Md., May 18, June 8, 29, July 4, August 20; Scott's Run, Va., July 4, 1918, McAtee; Falls Church, Va., July 30, N. Banks.

C. cydoniae Fitch.—Has a greater variety of food plants than most of the species of the genus, occurring in numbers on at least 3 groups of plants, hawthorn (*Crataegus* spp.), June-berry (*Amelanchier* spp.), and buttonbush (*Cephalanthus occidentalis*); has been taken also on quince; local records date from May 10 to September 7. According to Dr. Drake this species shows considerable variation in height of the hood.

C. juglandis Fitch.—Abundant locally on black walnut (*Juglans nigra*); extreme dates of collection, April 26 and September 18. P. I.

C. marmorata Uhler.—Abundant on Compositae, including *Aster* spp., *Solidago* spp., and *Ambrosia trifida*; has been collected from June 15 to September 25. V. P. I.

C. mollicula Osborn and Drake.—Glen Echo, Md., July 23, August 22, 1922; Chain Bridge, Va., September 25, 1921, on willow; April 16, 1922, J. R. Malloch.

C. pallida Osborn and Drake.—Very abundant on its particular food plant, the red mulberry (*Morus rubra*); dates of collection range from April 16 to October 2. P. I.

C. pergandei Heidemann.—Omnipresent almost upon the alder (*Alnus rugosa*); has been taken in early spring on plum (*Prunus americana*) and in fall (including nymphs) on hackberry (*Celtis crassifolia*); season April 20 to October 11. Has been taken also on willow, hazel, elm and crabapple; comes to light. The record of February 18, 1884 (including nymphs) cited in original description, seems to be erroneous; the date is too early for development of foliage by the food-plants. P. I.

C. pruni Osborn and Drake.—Abundant on wild black cherry (*Prunus serotina*) season May 9 to September 27; eggs May 9 and 18. V. P. I.

C. ulmi Osborn and Drake.—Maryland near Plummer's Id., on elm (*Ulmus americana*), May 18, September 13; Plummer's Id., April 20, August 15, 27, October 5, November 30; Virginia near Plummer's Id., April 17, May 12; Turkey Run, Va., on *Ulmus fulva*, October 9, McAtee; Plummer's Id., Md., April 20,

1912, E. A. Schwarz and H. S. Barber; Cabin John Bridge, Md., July 29, 1914, H. S. Barber.

Genus *Stephanitis* Stal.

S. pyrioides Scott.—Washington, D. C., August 9, 1910, on *Azalea*, F. H. Chittenden; July 19, 1915, I. E. Latham.

Genus *Leptobyrsa* Stal.

L. rhododendri Horvath.—Common on laurel (*Kalmia latifolia*); season April 20 to October 30. P. I.

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Ohio Journ. Sci. 16, No. 7, May, 1916, pp. 326-328, fig. 1.

Records *Leptostyla oblonga* from Washington, D. C.

—Notes on North American Tingidae (Hem.-Het.).

Bul. Brooklyn Ent. Soc. 13, No. 4, Oct., 1918, pp. 86-88.

Records *Leptopypha costata* from our region.

—On some North American Tingidae (Hemip.).

Ohio Journ. Sci. 19, No. 7, 1919, pp. 417-421.

Original description of *Monanthia* (?) *necopina* from Bladensburg, Md.

—Notes on North American Tingidae, with descriptions of new species.

Florida Ent., March, 1921, pp. 49-54.

Records *Corythucha associata* from Washington, D. C.

GIBSON, EDMUND H.

—The genus *Corythucha* Stal (Tingidae: Heteroptera).

Trans. Am. Ent. Soc. 44, pp. 69-104, April 4, 1918.

Key to species; records 5 from our area.

—The genus *Gargaphia* Stal. (Tingidae: Heteroptera).

Trans. Am. Ent. Soc. 45, pp. 187-201, July 23, 1919.

Key to the species, but no D. C. records.

HEIDEMANN, ORTO.

—A new species of Tingitidae.

Can. Ent., 31, 1899, pp. 301-302.

Gargaphia angulata n. sp. described in part from specimens of local origin.

—[Exhibition of specimens.]

Proc. Ent. Soc. Wash. 4, No. 4, Jan., 1899-Dec., 1900 (July 16, 1901), p. 493.

Gargaphia undulata from D. C.; perhaps a mere error, but in any case a ms. synonym of *G. angulata*.

—Account of a new Tingitid.

Proc. Ent. Soc. Wash., 8, Nos. 1-2, pp. 10-13, 2 figs., July 17, 1906.

Original description of *Corythucha pergandei* chiefly from local material; also notes on life history of the species.

- Two new species of North American Tingitidae.

Proc. Ent. Soc. Wash. 10, Nos. 1-2, pp. 103-108, Pl. 4; Sept. 11, 1908.

Original description of *Leptobursa explanata*, in part from local specimens; this name a synonym of *Stephanitis rhododendri* Horvath; full notes on life history.

- New species of Tingitidae and description of a new Leptoglossus (Hemiptera-Heteroptera).

Bul. Buffalo Soc. Nat. Sci. 9, No. 2, 1909, pp. 231-238, 6 figs.

Key to the species of *Atheas*; describes *A. insignis* n. sp. from local material.

- A new species of North American Tingitidae.

Proc. Ent. Soc. Wash. 13, 1911, pp. 180-181, fig. 4.

Original description of *Leptostyla chitortae*, chiefly from local material.

- Two new species of Lace-bugs (Heteroptera; Tingidae).

Proc. Ent. Soc. Wash. 18, 1916, pp. 217-219, Pl. 17 (June 11, 1917).

Describes as new *Leptopypha distinguenda* a synonym of *L. costata* Parshley; and *Acalypta grisea* a synonym of *A. lillianis* Bueno.

McALEER, W. L.

- Psyllidae wintering on conifers about Washington, D. C.

Science, N. S. 41, p. 940, June 25, 1915.

Piesma cinerea incidentally mentioned.

- Key to the nearctic species of *Leptopypha* and *Leptostyla* (Heteroptera; Tingidae).

Bul. Brooklyn Ent. Soc. 12, No. 3, July, 1917, pp. 55-64.

Records 2 species of the former and 3 of the latter genus from our region.

- A few notes chiefly on the names of Nearctic Tingidae.

Bul. Brooklyn Ent. Soc. 12, No. 4, Oct., 1917, pp. 78-79.

Four species of *Corythucha* and one of *Gargaphia* noted for the D. C. region.

OSBORN, HERBERT, and DRAKE, CARL J.

- The Tingitoidea of Ohio, Ohio State Univ. Bul., 20, No. 35, June, 1916, pp. 217-247, Pls. 9-10, 9 figs.

Keys to the genera and species and list of 18 species taken in the state.

Records 1 *Leptostyla* (*heidemanni*), 1 *Gargaphia*, and 2 *Corythucha* (*bulbosa*, *pruni*) species from the D. C. region, those of which the specific names are given being described as new.

- Notes on American Tingidae with descriptions of new species.

Ohio Journ. Sci. 17, No. 8, June, 1917, pp. 295-307, figs. 1-2.

Records one species of *Atheas* and 4 of *Corythucha* from our region of which *C. coryi* is described as new.

PARSHLEY, H. M.

- Notes on North American Tingidae (Hemiptera).

Psyche, 24, No. 1, pp. 13-25, 2 figs.

Describes *Leptopypha costata* and *Melanorhopala infusata* from local material; gives key to species of latter genus.

- Hemipterological Notices 1 (Tingidae).

Ent. News, 31, 1920, pp. 271-274.

Adds a record of *Melanorhopala infusata*.

VAN DUZEE, E. P.

—Catalogue of the Hemiptera of America north of Mexico.

Univ. Calif. Publ. Ent. Tech. Bul. Vol. 2, Nov. 30, 1917, pp. 209-223, and 813-819.

Records 13 species of various genera from D. C.; several of the Md. and Va. records are of local application also but the abbreviations obscure the fact. The record for *Corythucha decens* Stal is an error; being based on specimens of *C. marmorata* Uhler; for explanation of ms. name *Caryphua undulata* see under Heidemann.

NINE NEW SPECIES OF CICADELLIDAE (HOMOPTERA) FROM THE UNITED STATES AND CANADA.

By J. G. SANDERS AND D. M. DeLONG.

***Dorycephalus knulli*, n. sp.**

Plate 11, Figs. 8, 8a.

In size and general appearance resembling *D. vanduzeei* but with head and pygofers proportionately longer, wing venation different, one instead of three carinae on vertex and face less tumid. Length ♀ 16 mm., ♂ 15 mm. Width (greatest across eyes) 1.5 mm.

Vertex very long and flat, four times length of pronotum with a conspicuous median carina from which the vertex gradually slopes to margin. Pronotum strongly and broadly notched posteriorly. Elytra in females very short, twice as long as pronotum, reaching only to middle of third abdominal segment. In male more than four times as long as pronotum.

Color: Dull grass green to greenish brown, with irregular mottling and small dots, fuscous.

Genitalia: Female last ventral segment almost twice as long as wide, posterior margin slightly sinuately produced. Pygofers three and one-half times as long as segment, tapering to slender foliaceous tips. Male valve very small, transverse, broadly and bluntly angled. Plates a little longer than last ventral segment, broad at base strongly concavely narrowed at half their length and produced into very narrow tips. Pygofers ten times as long as plates, longer than combined segments of abdomen.

Described from three female, three male and two nymphal specimens all taken at Cleveland, Florida, April 25, 26, 27, 1921, by Mr. Josef N. Knull and the junior author. The first specimen was collected by Mr. Knull, who has secured many other interesting records and to whom we dedicate this species.

***Euscelis divaricatus*, n. sp.**

Plate 11, Fig. 7.

In size and coloration resembling *parallelus*, but with distinct genitalia. Length, 5.5 mm.

Vertex almost parallel margined, broad, scarcely produced, almost three times as broad as long. Pronotum twice as long as vertex and twice as wide as long. Elytra long and narrow, greatly exceeding abdomen in male.

Color: Very similar to *parallelus*, greenish yellow. Vertex with broad black band between eyes just back of margin. Elytra brownish yellow, tips smoky,

veins pale. Face pale; sutures, a pair of spots above antennae, a heavy undulating line below ocelli and remnants of eight pairs of arcs, black.

Genitalia: Male valve broad, bluntly triangular. Plates broad at base, outer margins convexly rounded. Inner margins approximate one-third their length then abruptly concavely rounded to form divergent hooked apices.

Described from a single male specimen collected along a lagoon margin on Presque Isle, Erie Co., Pennsylvania, July 10, 1920, by the junior author.

Phlepsius marmor, n. sp.

Plate 11, Figs. 3, 3a, 3b.

Closely related to the *superbus*, *excultus* group from which it differs in coloration and genital structures. Length 5.5-6 mm.

Vertex narrower than pronotum, roundly produced, two and one-half times as wide as long. Scutellum comparatively large. Elytra short and broad.

Color: Dirty white, vertex with fuscous mottling near the apex and a pair of darker spots at base near eyes. Pronotum with anterior margin heavily marked with black or dark fuscous, posterior portion unmarked. Basal angles and a pair of spots on anterior disc of scutellum dark fuscous. Elytra pale with veins and several scattered patches of pigment coloration giving the elytra a mottled or marbled appearance and showing a conspicuous trilobate pale area along the suture. Face almost black above; below with traces of numerous dark arcs. Beneath pale.

Genitalia: Female last ventral segment one-half longer than preceding, lateral angles rounded off, posterior margin with a large "V" shaped notch at center reaching half way to base, either side of which is a pair of prominent blunt teeth. Male valve small only half as wide as plates at base, triangular. Plates rather short, broadly triangular, tips blunt and rounded.

Described from a series of ten specimens collected from "*Juniperus horizontalis*" at Onah, Manitoba, July 24, 1919, by Mr. Norman Criddle.

Phlepsius hemicolor, n. sp.

Plate 11, Figs. 2, 2a, 2b, 2c.

In general appearance and coloration resembling *fulvidorsum* and *particolor*, but ranging between these in size, and with distinct genital characters. Length, 6-6.5 mm.

Vertex forming a distinct margin with front, not strongly produced as in *fulvidorsum*, bluntly angled, two and one-half times as wide as long. Pronotum more than twice as broad as long and twice as long as vertex. Scutellum comparatively large. Elytra rather short and broad.

Color: Vertex, pronotum and scutellum buff, more or less mottled with fuscous. Vertex with four rather distinct spots just back of apex, disc of pronotum and two spots on each outer margin of scutellum fuscous. Elytra milky-white rather evenly and heavily inscribed with brownish pigment lines. Face heavily irrorate with brown, shading to almost black just beneath margin.

Genitalia: Female last ventral segment two and one-half times as long as preceding, posterior margin broadly shallowly excavated either side between prom-

inent rounded lateral angles and a black margined lobe on either side of a rather broad, shallow median notch. Male valve longer than preceding segment, broad, triangular. Plates one and one-half times longer than valve, gradually narrowed and convexly rounded at tips to form inwardly pointed apices.

Described from one female specimen collected by the authors at St. Croix Falls, Wisconsin, August 15, 1916, and one female and five males from Brookings, S. D., collected Sept. 8, 1920, by H. C. Severin.

***Phlepsius palustris*, n. sp.**

Plate 11, Figs. 1, 1a, 1b.

A large robust banded species with a very short flattened head. Length, 7-7.5 mm.

Vertex almost parallel margined, bluntly produced, more than four times as wide as long. Depressed behind margin, forming a very short foliaceous portion. Pronotum twice wider than long, more than three times as long as vertex. Scutellum large, elytra rather short and broad, compressed behind.

Color: Vertex and pronotum tawny, tinged with red; disc of pronotum brownish. Scutellum tawny, a white spot at apex and midway along either side bordered with fuscous. Elytra whitish crossed by three more or less distinct fuscous bands, one just back of scutellum, often incomplete, a broader one across middle of clavus and a third behind apex of clavus. Face tawny rather evenly irrorate with fuscous.

Genitalia: Female last ventral segment twice as long as preceding, side margins rounding to posterior margin which is slightly notched either side of produced central half. This portion is truncated and notched at middle forming two broad truncated teeth. Male valve broadly triangular; plates twice as long as valve, gradually narrowed to blunt pointed apices.

Described from four specimens swept from *Pinus palustris* in open pine woodland at LaBelle, Florida, April 18, 19 and 21, 1921, by the junior author.

***Thamnotettix albovenosus*, n. sp.**

Plate 11, Figs. 6, 6a, 6b.

In size and general appearance resembling *fitchii*, vertex not marked with black. Elytra dull orange yellow, veins white. Length, 3.35 mm.

Vertex bluntly angled, one-fourth wider between eyes than length at middle, and one-fourth longer than pronotum. Side margins of pronotum almost obsolete. Elytra rather long and narrow.

Color: Tawny to orange yellow. Vertex with blotches on disc and a connected row of spots between black ocelli bright, fulvous orange. Pronotum with five whitish longitudinal vittae. Elytra orange yellow, veins conspicuously white. Face dusky to brownish with several pairs of pale arcs.

Genitalia: Female last ventral segment a little longer than preceding segment. Lateral margins very short, then abruptly sloping to posterior margin which is slightly trilobate. Underlying membrane conspicuous as a lateral lobe at either side of segment. Male valve rounded, almost transverse lying in concavity of

last ventral segment. Plates more than three times longer than valve, rather broad at base, narrowed and produced in long tapering apices.

Described from a large series of specimens collected at Paradise Key, Miami and LaBelle, Florida, during April, 1921, by the junior author. The species was taken from maiden cane, *Panicum hemitomonum*.

Thamnotettix bisignatus, n. sp.

Plate 11, Figs. 9, 9a.

A rather small species with a black broken band across apex of vertex. Length 4 mm.

Vertex bluntly angled, a little broader between eyes than length at middle. Pronotum slightly longer than vertex, twice wider than long, lateral margins almost obsolete. Elytra exceed abdomen.

Color. Dull brownish, vertex with two black transverse blotches forming a broken band just above margin, the inner ends curved and extending over apex onto front. Elytra smoky subhyaline. Face darker, smoky.

Genitalia: Male valve narrow, bluntly triangular. Plates very narrow, gradually narrowed and produced into long pointed tips.

Described from a single male specimen collected at Cleveland, Florida, April 29, 1921, by the junior author.

Thamnotettix taxodii, n. sp.

Plate 11, Figs. 5, 5a, 5b.

In general appearance resembling *Th. waldana* but smaller with distinct genital characters and different coloration. Length, 4.5-5.5 mm.

Vertex bluntly angled, twice wider between eyes than length at middle. Pronotum strongly rounded anteriorly, twice as long as vertex and twice wider than long. Elytra appressed at tips.

Color: Vertex pale yellow unmarked. Pronotum, scutellum and elytra dull brownish green. Anterior margin of pronotum and entire costal margin of elytra pale yellow. Venation dark, only slightly visible. Face, venter and legs yellowish.

Genitalia: Female last ventral segment three times as long as preceding. Posterior margin slightly gradually produced to middle where it is faintly notched. Pygofer very long and slender. Male valve bluntly triangular almost twice as wide as long. Plates long, triangular, gradually narrowed to long pointed apices.

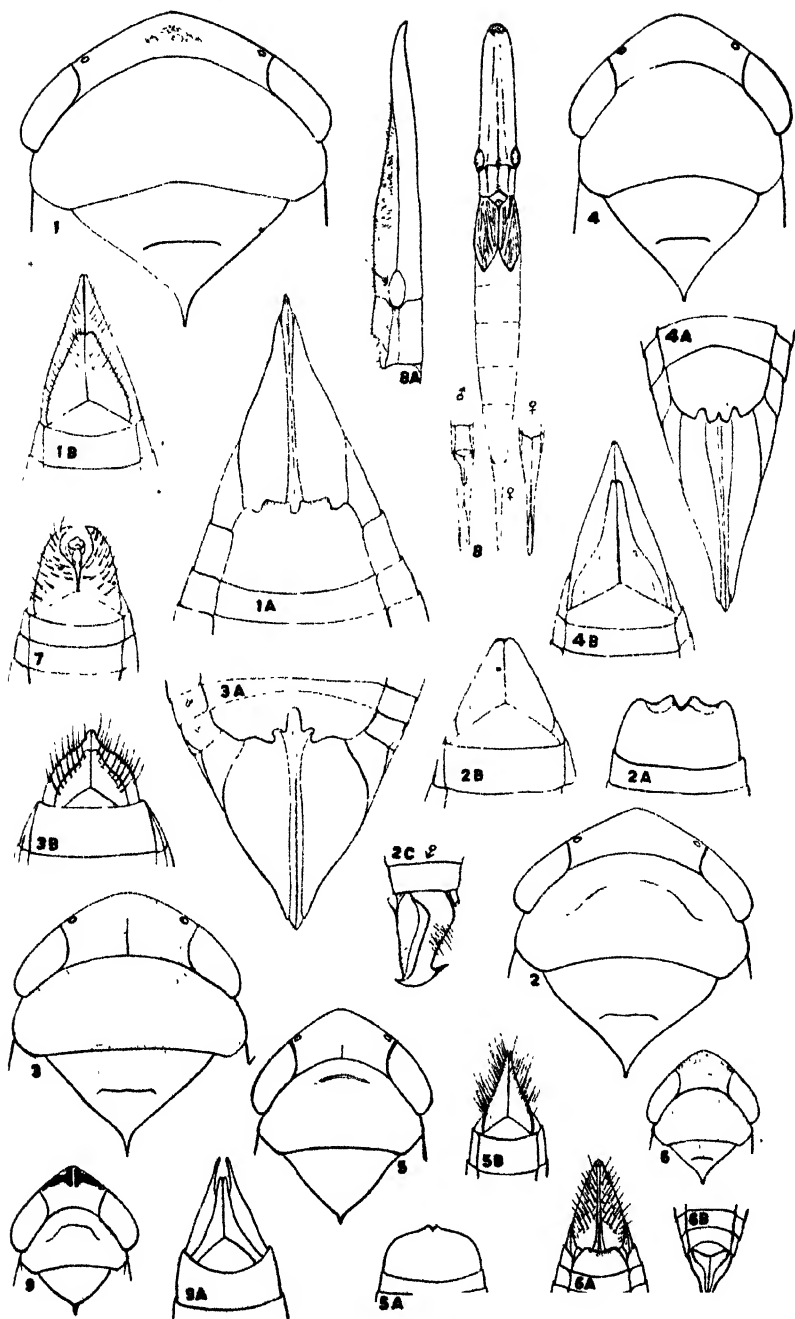
Described from one female and two males from Paradise Key, Florida, April 10, 1921, two males from La Belle, Florida, April 19 and 20, 1921, and one male from Cleveland, Florida, April 28, 1921, all taken from cypress by the junior author.

Chlorotettix dentatus, n. sp.

Plate 11, Figs. 4, 4a, 4b.

Size and general appearance of *unicolor*, but with head narrower and more produced, and genitalia distinct. Length 8 mm.

Vertex roundly produced, more than twice wider than long and almost



SANDERS & DELONG—NEW CICADELLIDAE.

one-half longer on middle than next eyes. Elytra long, greatly exceeding abdomen in both sexes.

Color: Varying in different specimens, pale straw to dull green, unmarked. Often with pale green mottling on vertex and pronotum.

Genitalia: Female last ventral segment with side margins rather short, rounding to posterior margin which is notched either side of a pair of rounded, slightly produced median teeth which occupy the middle-fourth, whole segment strongly convex ventrally, almost keeled, having the appearance from a ventral aspect of four teeth. Male valve rather short, bluntly angled. Plates broad at base, convexly rounding half their length, then rather abruptly constricted and produced as narrow parallel tips with blunt apices.

Described from four female and two male specimens collected July 3, 1919, near Washington, D. C., in a marshy meadow close to College Park, Md., by the senior author.

EXPLANATION OF PLATE.

- Fig. 1 *Phlepsius palustris* n. sp.; 1a-female genitalia, 1b-male genitalia.
 Fig. 2 *Phlepsius hemicolor* n. sp.; 2a-female; 2b and 2c-male.
 Fig. 3 *Phlepsius marmor* n. sp.; 3a-female; 3b-male.
 Fig. 4 *Chlorotettix dentatus* n. sp.; 4a-female; 4b-male.
 Fig. 5 *Thamnotettix taxodii* n. sp.; 5a-female; 5b-male.
 Fig. 6 *Thamnotettix albovenosus* n. sp.; 6a-female; 6b-male.
 Fig. 7 *Euscelis divaricatus* n. sp.; male genitalia.
 Fig. 8 *Dorycephalus knulli* n. sp.; adult female, female and male genital segments; 8a-head, side view.
 Fig. 9 *Thamnotettix bisignatus* n. sp.; 9a-male.

THE PRESENT STATUS OF THE COLEOPTERUS FAMILY PLASTOCERIDAE.

By J. A. HASTOR, *Bureau of Entomology.*

Candeze in his "Monographie des Elaterides" (1863) erected a tribe Campylides which he defined as follows: "Front carinate or not (carinate) on forward part. Mandibles protuberant, straight at the base and abruptly recurved at the tip for the most part. Eyes often globose and protuberant. Prosternum lacking a chin piece."

"Median coxae nearly contiguous and narrowing strongly the mesosternal fossa in front, and the anterior projection of the metasternum in back. Tarsi pubescent beneath."

This tribe included *Campylus* Fisch., *Oestodes* LeC., *Campylomorphus* Duv., *Plastocerus* LeC., *Octinodes* Cand., *Aplastus* LeC., *Euthysanius* LeC., *Aphricus* Lec., *Plectrosternus* Lacord., *Hemiops* Lap., *Pleonomus* Menet., *Macromalocera* Hope, *Cylindroderus* Esch., *Stichotomus* Cand., *Campyloxenus* Fairm.,

¹The genera *Campylomorphus* and *Campyloxenus* excepted.

Dironychus Lap., and *Isosoma* Fald. Of these genera the type genus *Campylus* Fisher is undoubtedly a true Elaterid. This genus is isogenotypic with *Lepturoides* Hbst., which having priority suppresses the tribe name. In my arrangement of the Elateridae based on larval characters (Annals Entomological Society of America X p. 250, 1917) this tribe is referred to as the *Lepturoidinae*. The larvae of the type genus have very strong affinities with the genus *Athous* Esch. The genus *Oestodes* LeConte is in no way related to the *Lepturoidinae*. I have figured the larva of this genus (L. C. page 251) and placed the genus in a new tribe, *Oestodini* in my sub-family *Phyrophorinae*. I am inclined, however, to question the position of this genus.

Candeze in his later work (Catalog Methodique, 1891) recognized the heterogeneity of this tribe and separated the genera *Lepturoides* Hbst., *Oestodes* LeC., *Bladus* LeC., *Phanophorus* Sol., *Campylomorphus* Duv., *Macromalocera* Hope, *Pleonomus* Menet., *Nomopleus* Cand., *Cylindroderus* Esch., *Stichotomus* Cand., *Octinodes* Cand., *Plestrosterus* Lacord., *Hemiops* Lap., *Adolesches* Cand., *Parhemiops* Cand., *Hemiopsida* MacLeay, and *Isosoma* Menetr., as the tribe *Campylites* (though he remarked in a foot-note that *Lepturoidites* should be employed if strict priority was adhered to) from the remaining genera *Plastocerus* LeC., *Aplastus* LeC., *Euthysanius* Lec., *Aphricus* LeC., and *Eniconyx* Horn, for which he erected a new tribe the *Plastocerites*.

Schwarz (Gen. Ins. fasc. 50, 1907) characterized the family, which he called *Plastoceridae*, as having the abdomen of males with 6 or 7 segments, and the females with 5 or 6 segments. The segments, from the 3d on, are freely movable; the posterior border of 2d, 3d and 4th segments are provided with a shining intersegmental membrane. The antennae of the males are often more or less pectinate. The elytra of the females are in some genera shortened. Mandibles are protuberant and abruptly bent inwardly from the middle to form right angles. The last joint of the maxillary palpi is cylindrical. He includes *Dodecacius* Schwarz (Peru, 2 sp.), *Euthysanius* LeConte (California, 2 sp.), *Cepholodendron* Latr. (Africa and Madagascar, 5 sp.), *Ceroplastus* Heyden to include *P. angulosus* Germar (Asia Minor), *Octinodes* Cand. (*Plastocerus* Lec. not Schaum) (1 Californian, and 6 South and Central American sp.), *Phyllocerus* Serv. (Southern Europe and Caucasus, 3 sp.), *Diplophoenicus* Cand. (Madagascar 1 sp.), *Eniconyx* Horn (United States, 2 sp.), *Aplastus* LeC. (California, 6 sp.), *Euplastius* Schw. (1 sp. from California and 1 sp. from Alabama), *Aphricus* Lec. (California, 1 sp.).

Eniconyx Horn and *Aphricus* LeC., are two North American genera, which Horn believed to be very closely related, and to show a distinct relationship between the *Gardiophorinae* and

the other Elaterids, a position which I do not believe will be substantiated when the larval forms are finally recognized.

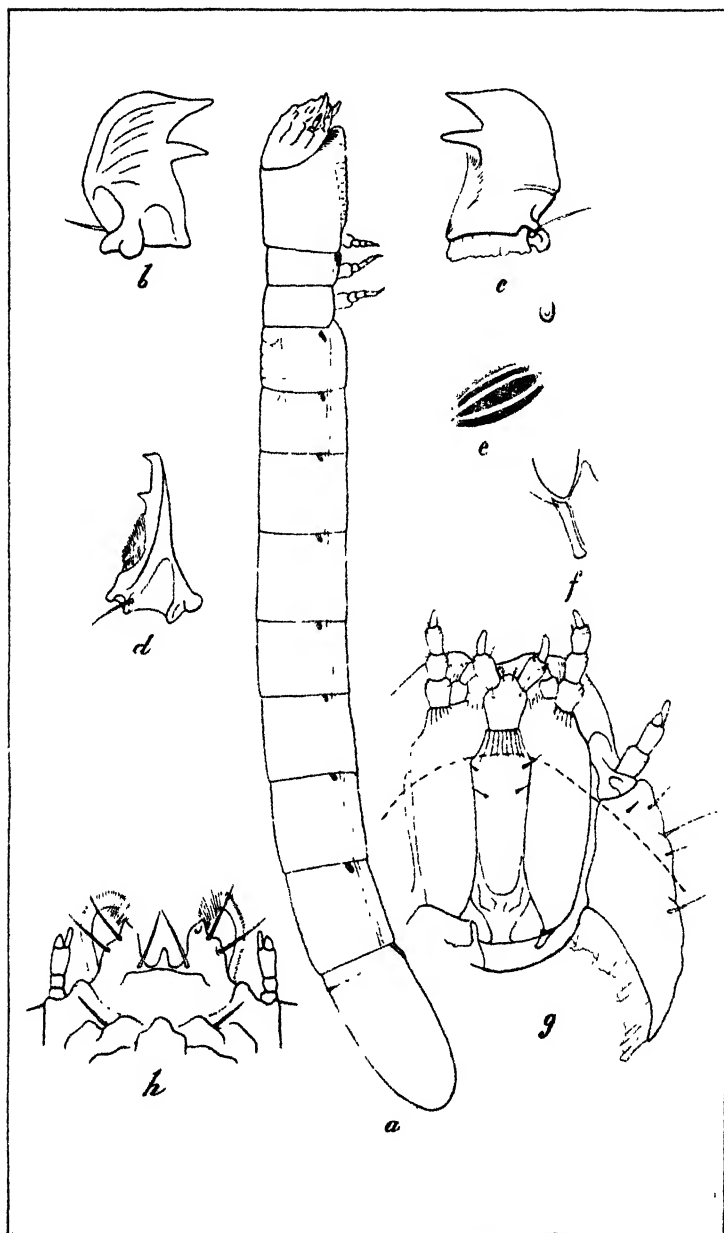
In addition to these two genera, the genera *Aplastus* LeC., *Octinodes* Candere (*Plastocerus* LeC. not Schaum) and *Euthysanius* LeC. are of particular interest to North American entomologists. These genera all occur on the West Coast and in the southwestern United States and Mexico, and have always been a source of perplexity to workers in the Serricornia.

During the spring of 1923, Mr. W. B. Turner, who was formerly associated with me at the Hagerstown Laboratory and is now located at the Sacramento Laboratory of the Office of Cereal and Forage Crop Insect Investigations, sent in a report of the serious depredations of Cebrionid larvae in wheat fields in several parts of California. This note seemed most remarkable as no true Cebrionids were known to occur in California. Through Mr. Walton I suggested to Mr. Turner that there was a possibility that these insects which he determined as Cebrionids were larvae of the Californian Plastocerid genus *Euthysanius*. Knowing Mr. Turner to be a keen and careful observer I was sure that he was not mistaken as to the Cebrionid type of these larvae, as he had reared *Cebrion bicolor* Fab. at the Hagerstown Laboratory.

Later a consignment of material was received from Mr. Turner at the Office of Cereal and Forage Crop Insect Investigations and was very generously loaned me by Mr. Walton. Two different larvae, though extremely similar, were found which both Dr. Adam Boying and myself have examined very carefully. These are, without the slightest possibility of doubt, true *Cebrionids*.

Among the material was a reared specimen from a mass of material collected in October, 1915, by Mr. E. L. Barrett, who mistook the larvae for *Eleodes*. These larvae were collected in an alfalfa field near Laguna, California, in damp soil. On April 19, 1916, in examining the rearing cage in which these larvae were placed a pupa was found from which an adult emerged on April 28. This adult is *Aplastus speratus* LeC. In the same shipment were several larvae much too large to be larvae *Aplastus*; these were collected in 1919 at Tracey, California, and are undoubtedly the larvae of *Euthysanius* Lec., as the affinities of this genus and *Aplastus* are clearly indicated by the brachypterous females of both genera as figured by Horn (Transactions American Ent. Soc. Vol. 9, plate 1, 1881). I am also very much inclined to place *Octinodes* in this same group of Cebrionids. *Octinodes* is the type genus of the so-called *Plastoceridae*.

We, therefore, no longer have reason to maintain a family of Coleoptera known as *Plastoceridae* as the more important genera and the type genus of this family are undoubtedly either true Cebrionids, true Elaterids, or insects of which the affinities are



HYSLOP-APLASTUS SPERATUS.

so extremely doubtful that their grouping into a family is misleading.

This present development, on the one hand, removes the *Plastoceridae* as an intermediate family between the two families *Elateridae* and *Cebrionidae*; on the other hand, the adult characters used to separate the *Elateridae* and *Cebrionidae* are extremely ephemeral and the larvae of the two families have so many characters in common that there is not much reason for considering them as more than sub-families of a broader *Elateridae*.

The principal differences between the *Cebrionidae* and *Elateridae* as now recognized are as follows:

CEBRIONIDAE.	ELATERIDAE.
Adult.	Adult.
Mandibles protuberant. 5 or more visible ventral abdominal segments at least in female. Well developed to feebly developed tibial spurs. Anterior tibia more or less expanded at the tip. Meso coxae approximate.	Mandibles not strongly protuberant. 5 visible ventral abdominal segments, both sexes. Tibial spurs lacking or very feeble. Anterior tibia not expanded at the tip. Meso coxae distinctly separated.
Larvae.	Larvae.
Most of stipes and mentum concealed by but not fused with a very pronounced projection of prosternum. Cervical membrane very large and eversible forming a balloon-shaped sack when the head is raised.	Stipes and mentum visible in toto from below. Cervical membrane not eversible.

LeConte (1853) quite correctly classified these insects when he placed *Aphricus*, *Plastocerus* (*Octnodes*) and *Euthysanius* with *Cebrio* and *Scaptolenus* in his 5th Division of the *Elateridae*, the *Cebrionites*.

EXPLANATION OF PLATE.

Larva of *Aplastus speratus* Lec.

- Fig. a. Lateral aspect of larva.
 " b. Ventral aspect of right mandible.
 " c. Dorsal aspect of right mandible.
 " d. Lateral aspect of right mandible.
 " e. Abdominal spiracle.
 " f. Cardo.
 " g. Ventral aspect of head.
 " h. Fronto clypeal region and antennae.

THE PRESENT STATUS OF COQUILLETT'S *HYPOCHAETA LONGICORNIS* SCHINER (DIPTERA).

By J. M. ALDRICH, U. S. National Museum.

In Coquillett's Revision of North American Tachinidae, 1897, page 65, a fly from the White Mountains, New Hampshire, is identified with only a few words of description as *Hypochaeta longicornis* Schiner, a European species. The subsequent disposition of this name, and especially of the North American species involved, is worthy of notice.

The species that Schiner called *Frivaldskia longicornis* he attributed to Fallén, but this proved to be a misidentification for *Tachina distincta* Meigen, although Schiner's species belongs to the same subgenus according to Bezzi in the Palaearctic Catalogue, 1908. Brauer and Bergenstamm, 1889, erected *Hypochaeta* for Schiner's form; but this was unnecessary, as *Frivaldskia* 1861 was based upon the true *longicornis* Fallén, and *Campylochaeta* 1859 upon the closely related *Tachina obscura* Fallén. Bezzi recognized *Campylochaeta* in 1908, but admitted *Frivaldskia* as a subgenus including *distincta* Meigen and the true *longicornis* Fallén.

None of the preceding genera and species are now considered to be North American, and the question remains, what shall we call Coquillett's White Mountains species?

Townsend described in 1915 (Proc. U. S. N. M., vol. 49, p. 423) a new genus and species as *Chaetophlepsis tarsalis*. He had a single female from San Rafael, Casma, Peru. He compared this with Coquillett's White Mountains form, and begins his generic description with the words, "Differs from *Hypochaeta* as follows:" The characters listed however are common to both species, except that in the first line he mentions a small bristle near the mouth; even this supposed difference holds for only one side, the other being as in Coquillett's specimen. The two supposed species are clearly identical; hence it follows that Townsend did bestow, although unintentionally, a valid generic and specific name upon the North American species.

The following year gave *tarsalis* another baptism, as H. F. Smith named it *Hypochaeta eudryae* new species in Proc. Ent. Soc. Wash., 1916, vol. 18, p. 94. He had material from Massachusetts, New York, and a specimen labeled "White Mts., Morrison." He lists the last without mentioning the important fact that it bears Coquillett's label "*Hypochaeta longicornis* Schin."

My conclusion is that Coquillett's species should now be known as *Chaetophlepsis tarsalis* Tns., of which *eudryae* is a synonym. The material in the National Museum includes Coquillett's original specimen, Townsend's type, Smith's holotype and four (not three) paratypes, together with single speci-

mens from Holly Springs, Miss., Plummer's Id., Md., and Glen Echo, Md. (Malloch). I have also determined a specimen from Greenwood, Miss., bred from a noctuid larva. Smith's holotype was reared from *Eudryas grata*. Brimley, Ent. News, XXXIII, 1922, 23, has reared the species from *Melittia satyri-formis* at Raleigh, N. C.

The genus can be recognized instantly by two characters: the ocellars are tall and reclinate, and the first vein bears large hairs on its whole length. It may be added that the eyes are hairy, the facial ridges with coarse bristles much above the middle, the first posterior cell ends in the tip of the wing, and the hind cross-vein is drawn in, nearer the small one than the bend, making the last section of the fifth vein more than half the preceding. A second species, *townsendi* Smith, differs in having red legs and abdomen; it is known only in a single male from Miami, Florida.

THREE NEW FORMS OF RHOPALOCERA FROM COLOMBIA AND A NEW GEOMETRID MOTH FROM MADEIRA (LEPID.).

By WM. SCHAU'S AND T. D. A. COCKERELL.

DANAIDAE.

Ceratinia coeno angustior new subspecies.

Male similar to *C. coeno* Hewitson, the black border of termen of forewing narrower, the white spots not enclosed.

Expanse 68 mm.

Habitat.—Rio Casanare, near Sacama, Boyaca Province, Colombia.

Type.—Cat. No. 26213 U. S. N. M.

NYMPHALIDAE.

Callicore ducei, new species.

Male.—Antennae black tipped below with yellow and with white points along underside of shaft. Palpi black above, white underneath. Head black; a macular white line around eyes. Body black above, underneath white with black irrorations; legs white mottled with brown on upper side. Forewings black with scattered blue scales at base forming slight streaks above median and submedian veins; an iridescent bluish green fascia from subcostal vein at middle of wing to below submedian near tornus, 4 mm. wide at center. Hind wings black with a narrow submarginal blue band a little over 1 mm. wide and 3 mm. from termen extending from vein 6 to vein 1; cilia mottled with white on both fore and hind wings. Forewings below spectrum red suffused with white at base; basal third of costa white, the extreme edge finely black and a fuscous streak above subcostal; the red space limited by a broad black fascia, outbent from costa postmedially, at vein 4 approximated to termen which it reaches between vein 2 and submedian; a spot at tornus below submedian and termen from above vein 2 white expanding on costa to black fascia; a fine subterminal

black line from costa suffusing with black fascia below vein 4. Hindwings below white; costa to postmedial line spectrum red, the lines fine, black; a sub-basal line along vein 8; antemedial line incurved joining postmedial above anal angle; subterminal line parallel with postmedial; a finer terminal line; upper annular line ovate containing only one distinct point, the lower point only faintly indicated; lower annular line slightly constricted at its middle with two distinct black points.

Expanse 40 mm.

Habitat.—Jolima, Colombia, West side of Magdalena River, above town of Chaparral on Rio Soldana.

Type.—Cat. No. 26074. U. S. N. M.

A long series of specimens examined. Allied to *C. nystographa* Gueneé which has a much narrower fascia on forewing and the red space of underside reduced.

RIODINIDAE.

Helicopsis medialis, new species.

Female.—Antennae with bases of joints white, much more broadly so beneath than above. Palpi white. Forewings with basal part pale buffy orange; medial area cream color, very wide, its greatest width about 8.5 mm.; apical area black as in *H. acis*, the black extending narrowly along the lower margin to meet the orange. Hindwings with pale buffy orange base, extending nearly 10 mm.; beyond that black, with tails as in *H. acis*, but with five submarginal cream colored lunules or crescents, and in the anal region a second one, hardly curved, just above the submarginal one. Forewings beneath as above, but paler, the apex rather gravis. Hindwings beneath brown discally, with two rows of silvery spots, of the same general character as those in *H. cupido*, but the spots of the second row are arranged more as *H. divergens*.

Expanse 21 mm.

Habitat.—Near Labranza Grande, on the Rio Labranza Grande, State of Boyaca, Colombia. Alt. 1140 meters.

Type.—Cat. No. 26075. U. S. N. M.

No doubt a local derivative from *H. acis* Fabr. It combines the characters of the two sexes of the normal form.

GEOMETRIDAE.

Cosymbia lilacinipes, new species.

Female.—Wings shaped as in *C. punctaria* (Linnaeus), not narrow and pointed as in *C. maderensis* Baker; antennae simple, above lilacine basally, grey beyond, beneath whitish; vertex covered with reddish ochreous scales, cheeks (behind eyes) white, front dusky lilacine, oral region creamy white; palpi lilacine above, white beneath; anterior legs rosy lilac in front, white behind, the other legs creamy white, shining; thorax and base of abdomen dorsally clothed with warm terra-cotta red, like the wings; abdomen paler and yellow, the segments with a dorsal lilacine spot, dark in middle; wings above warm terra-cotta red (redder than *punctaria*), with a pale dusky median band across both pairs as in *punctaria*, but no other conspicuous markings; postmedian dots, distinctly visible with a

lens in very irregular series, which if connected would form a zigzag band; half way between the median band and base of wing are a few obscure dots, three in number; costa irrorated with lilacine markings; fringe pinkish; underside paler, yellowish, the anterior wings only with median band, and basad of that a large pale lilacine grey cloud.

Expanse 29 mm.

Habitat.—Funchal, Madeira. Dec. 25, 1920. (Fred. Jones.)

Type.—Cat. No. 26214. U. S. N. M.

A NEW GENUS AND SPECIES OF MOTH OF ECONOMIC INTEREST IN THE UNITED STATES NATIONAL MUSEUM.

By W. SCHAUS,

Honorary Assistant Curator, United States National Museum.

Family Noctuidae.

Subfamily Noctuinae.

Saccharophagos, new genus.

Male.—Proboscis fully developed; palpi porrect more than twice the length of head, the third joint downbent, thickly clothed with short hairs, slightly fringed below; frons with short tuft; eyes large, round; antennae with short bristles; thorax smooth, clothed with hair and scales; abdomen smooth extending well beyond hindwing; the anal hairs long; femora inwardly fringed, tibiae fringed with hair above and below, tarsi smooth, the spurs rather long. Forewing broad, apex acute, the termen well rounded; vein 3 from before angle; 4 and 5 from angle; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with termen well rounded; veins 3 and 4 from angle of cell; 5 from above angle; 6 and 7 from upper angle; cell less than half the length of wing.

Type of genus *Saccharophagos mochisa*. Can be placed near *Chadaca* Walker.

Saccharophagos mochisa, new species.

Male.—Palpi fuscous. Body and wings hair brown suffused with drab. Legs hair brown, the throat, fore femora and fore tibiae fuscous. Forewing: a sub-basal black point; a fuscous streak above and one below median vein; fuscous streaks above and below vein 4 near cell; an outcurved postmedial row of small fuscous black points, almost obsolescent from vein 3 to inner margin; terminal black points on interspaces. Hindwing slightly darker shaded in disc. Forewing below with outer half of costa and termen slightly paler, the inner margin broadly drab buff. Hindwing below with a fuscous terminal line; a fuscous streak on dicocellular, from it a short streak proximally. Expanse, 37 mm.

Habitat: Los Mochis, Sinaloa, Mexico.

Type Cat. No. 26486, U. S. N. M.

Bred by R. R. Van Zwaluwenberg.

The larvae feed on dry tissue of cane butts confined to a single internode.

A NEW SPECIES OF VOLUCELLA (DIPTERA).

By CHARLES T. GREENE, *Bureau of Entomology.*

This material was reared by the writer at the Eastern Field Station, Falls Church, Virginia.

This species runs to *Volucella anna* in Williston's Synopsis but can be easily separated by the following characters:—the color and size of the antennae; the length and outline of the face and the infuscation of the wing.

The side view of the face and the infuscation of the wing of *Volucella anna* are shown in the plate for comparison and are drawn from the type specimen. The type does not show any hairs on the basal section of the second vein.

***Volucella nigra*, new species.**

(Plate 13, Figs. 1-6.)

Male.—Face entirely black, shining, with a yellowish brown pruinose area on the upper part of the facial depression below the antennae; a long narrow area (in certain lights) along each side of the facial tubercle is dull and a dull brown stripe on each side of the facial projection reaching from the eye to about half way to the tip at the lower end of the face; hair on face and front black; that on the front and a small area on each side of the face below the antennae is long; facial tubercle with short, black, bristly hairs. Antennae entirely black; third joint not more than twice as long as the greatest width—fig. 5. Eyes contiguous, densely pilose with brown pile. Thorax and scutellum black, shining, in certain lights very faintly bluish; the pile and hairs black; on the edges the hairs are longer while those on the edges of the thorax are more like macrochaetae. Abdomen black, shining, with a more bluish reflection (the blue is similar to new blue); the first segment and a narrow area along the base of the second segment is brownish in color; the hairs on the abdomen black, increasing in length towards the apex, hairs on the last segment quite long. Legs brownish-black; all pile and hairs black; pulvilli luteous. Wings with a brown infuscation on the basal half; the infuscation is paler on the costal side of the first and second basal cells; yellow at the tip of the auxiliary vein; second vein with bristly hairs from the base to the origin of the third vein; anterior crossvein short and straight, fig. 6.

Female.—Very similar to the male except the eyes are broadly separated and the brown on the second segment covers nearly the basal half.

Length, 11 mm., both sexes.

Described from four specimens—two males and two females.

Type locality, Miami, Florida.

Type.—Male, allotype, female. Cat. No. 26200 U. S. N. M.

The larvae were collected March 3, 1917 by Dr. T. F. Snyder at Miami, Florida. They were in the moist spongewood at the base of a paw-paw tree (*Carica papaya*) where the sap was fermenting, due to frost injury.

Larvae pupated May 3 and 4, 1917.

Two males and two females emerged June 1, 1917, at Falls Church, Virginia, Hopkins U. S. No. 14993.

Larva.—(Fig. 1.) Opaque, long, nearly cylindrical, slightly flattened, pale luteous yellow. Mouth parts suctorial. No definite segmentation. Numerous transverse wrinkles. Surface covered with a fine, nearly microscopic, pale yellow pubescence; along the lateral edges are small processes solid at the base terminating into three hair-like projections. Across the anterior end and down a short distance on each side, the surface is covered with short, brown, chitinous spines. Anterior spiracles are extremely small, brown, cylindrical, tapering slightly towards their apex (too small to be used for determination). Antenna (fig. a) are pale yellowish white with a single basal joint which is bifid and widely separated at the apex; each antennae is composed of a large, cylindrical joint, slightly longer than its diameter with a broad, transverse, yellowish-brown band in the center; at the apex are two small thimble-like projections; the inner one is shorter and has a very small, round tubercle at its apex. The last segment with two, long, cone-like projections on the outer posterior edge and the penultimate segment has four, shorter, cone-like projections on outer posterior edge. Posterior spiracles are faintly shining, dark red, tapering very slightly towards the apex; a transverse suture near the base. Spiracles are composed of two halves (the right half drawn, fig. 1 b) each half has near its inner side, a large, nearly round button with a rectangular depression in the middle and a series of narrow wrinkles radiating towards the outer edge; there are four sinuous spiracles to each plate composed of broad, yellow lines or markings on the surface; the balance of the plate is deep reddish to black near the edge. There are seven pairs of ampullae; the two anterior pairs are more widely separated transversely; the surface of these ampullae is covered with numerous, short, brown, chitinous spines.

Length: 20 mm.; width, 4 mm.

Pupa.—(Fig. 2.) Very pale, dull, yellow, with the surface completely covered with a fine, microscopic, yellow pubescence. It is cylindrical, tapering slightly towards caudal end and the cephalic end truncate. Across the cephalic end are three short rows of brown, short, chitinous spines. Anterior spiracles are extremely small, cylindrical; antero-dorsal spiracles are at the upper angle of the pupa, they are separated by a space equal to twice the length of one spiracle; each spiracle is dark, yellowish-red, shining, slightly turned upward; front surface bare, the upper and lateral surface with numerous, large, round tubercles; the base is entirely encircled with very fine, granular tubercles (fig. 2 c); (the spiracles do not always protrude far enough to show all of this fine granular surface) at the lower edge of the cephalic end are three large wrinkles covered with brown chitinous spines, in the middle of these wrinkles is where the mouth parts are retracted. The ventral surface is flat with several small rows of brown chitinous spines, which are the remains of the ampullae of the larva. Posterior spiracles protrude about 1.5 mm., the details are the same as in the larva.

Length, 10 mm.; diameter, 4.5-5 mm. at front end.

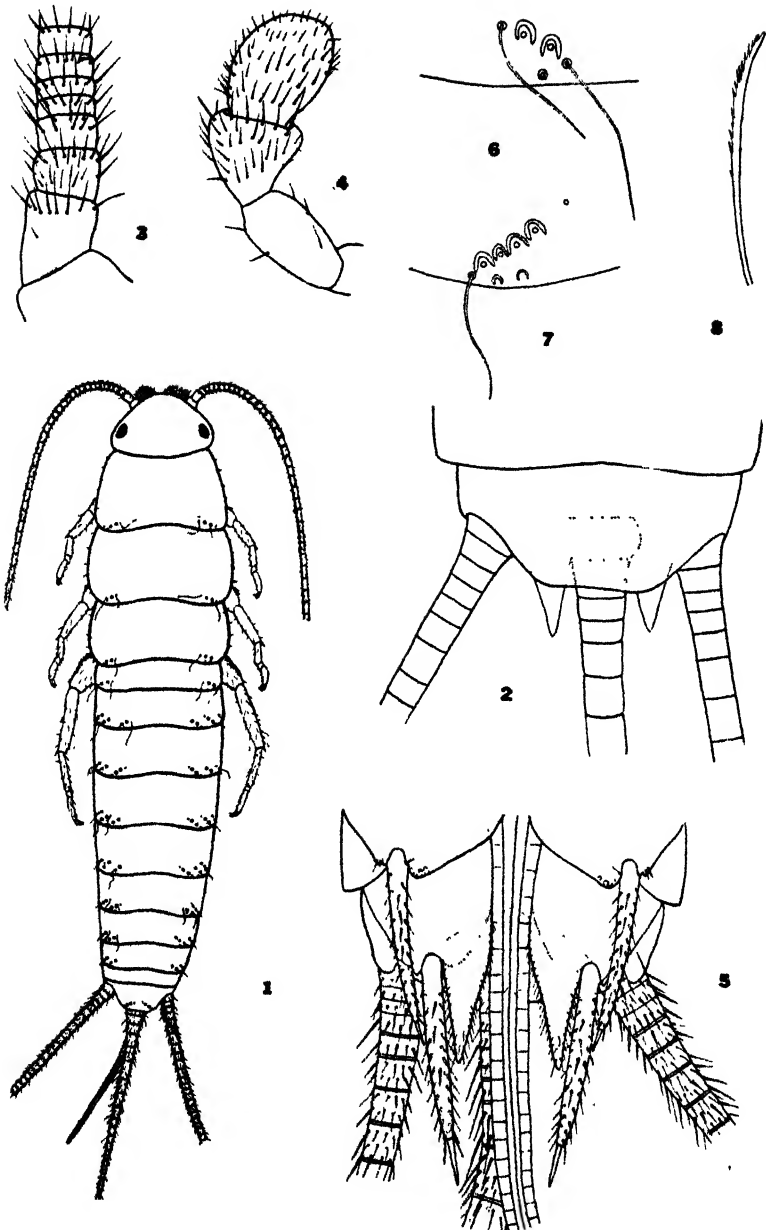
EXPLANATION OF PLATE.

(Drawings by C. T. Greene.)

Fig. 1 *Volucella nigra* Greene, larva, dorsal view.

" 1 a. " " " antennae of larva.

" 1 b. " " " posterior spiracle, right half drawn.



FOLSOM—CTENOLEPISMA REDUCTA

A NEW LEPISMID FROM PORTO RICO.

By J. W. FOLSOM.

(Plate 14, Figs. 1-8.)

The species of *Thysanura* described below was collected by G. W. Wolcott, of the Bureau of Entomology, during his investigations in Porto Rico.

***Otenolepisma reducta* new species.**

Silvery white dorsally and ventrally; mottled with dark brown scales dorsally; body color brownish yellow. Body elongate (fig. 1); thorax but slightly wider than abdomen, and three fifths as long. Pronotum, mesonotum and metanotum in relative lengths as 10:11:9. Prothorax widest posteriorly. Abdomen almost parallel-sided, slightly narrowed posteriorly. Ninth urotergite one-half as long as the tenth. Tenth urotergite (fig. 2) trapezoidal, with postero-lateral angles rounded, and middle region of posterior margin almost straight, feebly concave. Length of antennae unknown; basal segments as in figure 3. Labial palpi as in figure 4. Cerci and pseudocercus (fig. 5) incomplete. Paramedian ventral processes of female (fig. 5) elongate-conical, each extending about to the middle of the adjacent stylus. Styli (fig. 5) two pairs, on eighth and ninth abdominal segments respectively, slender. Ovinositor (figs. 1, 5) slender, rod-like, in length as in figure 1. The setal combs visible in dorsal aspect (fig. 1) are as follows in number. Pronotum to metanotum, inclusive, 1+1; first abdominal segment, 1+1; second to fifth abdominal, 3+3; sixth to eighth, 2+2; ninth, 0; tenth, 1+1. Of these, lateral combs occur on abdominal segments 1 to 5 inclusive. The setae of the combs in this species are reduced in number. Each dorsal comb (fig. 6) consists of four setae in an oblique line, the seta at each end of the series being filiform and variously curved or bent. The intermediate setae of the comb are probably macrochetae, but were invariably absent, and are indicated in the figures only by their sockets. Each lateral comb consists commonly of six setae: four macrochetae between two filiform setae. Ventrally, there are 1+1 setal combs on abdominal segments three to eight, inclusive; each comb (fig. 7) containing four macrochetae. All these combs are so small as easily to be overlooked; in figure 1, the dots indicating these combs are greatly exaggerated in size.

Scales obovate, oval to orbicular, very finely striated. Serrate setae (fig. 8) occur in 2 clusters on each side of the front (fig. 1). Length: males, 6 mm.; females, 7 mm.

Porto Rico, G. W. Wolcott, collector. Two males and six females.

Syntypes.—Cat. No. 26368, U. S. N. M.

EXPLANATION OF PLATE.

Otenolepisma reducta.—Fig. 1: Dorsal aspect of female, X 13. Fig. 2: Tenth urotergite of female, X 44. Fig. 3: Basal segments of right antenna, X 76. Fig. 4: Left labial palpus, X 76. Fig. 5: Ventral aspect of abdominal appendages of female, X 44. Fig. 6: Dorsal setal comb from right side of sixth abdominal segment, X 284. Fig. 7: Ventral comb from right side of fifth abdominal segment, X 284. Fig. 8: Serrate seta from front, X 212.

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A COMPARISON OF THE LABIUM IN CERTAIN HOLOMETABOLOUS INSECTS FROM THE STANDPOINT OF PHYLOGENY.¹

BY G. C. CRAMPTON, *Amherst, Mass.*

Only the elongated, more highly modified types of labium are discussed in the following brief notes, in which I have attempted to establish the homologies of the parts in higher insects; and the present brief discussion will serve as an introduction to a more extensive paper which I have almost completed, dealing with the modifications of the labium throughout the orders of insects, from the standpoint of phylogeny. For the greater part of the material used in the preparation of the present paper, I am greatly indebted to the kindness of Drs. J. M. Aldrich, J. W. Campbell, C. W. Johnson, and A. L. Melander, and I would use this opportunity of expressing my deep appreciation of their generosity which has made this work possible.

✓ The condition exhibited by the bumble-bee shown in Fig. 7, may be taken as the starting point for comparing the parts in the other insects here figured, since the labium of the bumble-bee is as primitive as any of the forms here discussed. In *Bombus*, as is shown in Fig. 7, a basal sclerite called the submentum, *sm*, is followed by an elongated, well developed mentum, *mn*, distal to which are the palpigers, *pgr*, bearing the labial palpi, *lp*. The labial palpi with their palpigers become approximated mesally; thereby displacing the paraglossae, *pgl*, and other parts which become crowded out of their normal position.

In the Coleopteran shown in Fig. 8, the basal sclerite *sm*, apparently represents the submentum *sm* of Fig. 7, and it is possible that the lateral projections "*lo*?" of Fig. 8 may become detached to form the lora *lo* of Fig. 7, although this is not certain. The mentum *mn* is elongated and well developed in the Coleopteran shown in Fig. 8, and is strongly suggestive of the type of mentum *mn* occurring in the bumble-bee (Fig. 7). In the Coleopteran shown in Plate III, Fig. 17, of the paper by Crampton, 1921, the submentum is incorrectly referred to as the "pregula," and the mentum is incorrectly called the "submentum," but in the Coleopterous larva shown in Plate IV, Fig. 27,

¹Contribution from the Entomological Laboratory of the Massachusetts Agricultural College, Amherst, Mass.

of the same paper, the parts are correctly designated, as in Fig. 5 of the present paper.

The palpigers *pgr* are large and well developed in the Coleopteran shown in Fig. 8, and to the base of each is attached a palpigeral tendon (palgigertendon), similar to those which are familiar to every student who has examined the mouthparts of a beetle in routine classwork in Entomology. The palpigers become approximated mesally, and they comprise the greater portion of the region *pm* of Fig. 8 which was called the prementum by Crampton, 1921, since it is the region immediately in front of the mentum. Due to the mesal approximation of the palpigers *pgr* (with their three-segmented palpi, *lp*), the ligula, *li*, becomes crowded out and is displaced anteriorly. The median portion of the ligula, *li*, probably represents the united glossae, while the lateral portions of the ligula represent the paraglossae which have united with the fused glossae, although the lateral lobes at the tip of the ligula may represent the still distinct terminal portions of the paraglossae.

The Neuropteran shown in Fig. 9 illustrates a slightly higher stage of specialization than that shown in Fig. 8. The distinct submentum *sm* and mentum *mn* of Fig. 8 apparently become united to form the slender columnar structure bearing the labels *sm* and *mn* in Fig. 9. The palpigers *pgr* of Fig. 9 become still more closely approximated mesally than they are in Fig. 8, thereby reducing the area between the palpigers in Fig. 8, which probably represents the remains of the united labiostipites. (For definition of the labiostipes, see paper by Crampton, 1921). The ligula *li* of Fig. 9 is composed largely of the paraglossae, whose lateral portions are bent forward in such a fashion that one can see only the mesal portion of the ligula *li* (composed of the united glossae and paraglossae) in the view shown in Fig. 9.

In the Mecopteran shown in Fig. 10 a still further stage of specialization is reached through the loss of the ligula *li* of Fig. 9, and the reduction of the labial palpi *lp* to two segments. The palpigers *pgr* unite basally, and the region *pm*, or prementum, is composed chiefly of the united palpifers. The slender columnar region bearing the labels *mn* and *sm* corresponds to the region bearing the same labels in Fig. 9, and probably represents the united mentum and submentum.

It is but a step from the condition exhibited by the Mecopteran shown in Fig. 10 to that exhibited by the Dipteran shown in Fig. 11, since in the Dipteran (Fig. 11) the labial palpi *lp* are two-segmented as in the insect shown in Fig. 10, the ligula remains atrophied as in Fig. 10, and traces of the palpiger *pgr* are still retained in the Dipteran shown in Fig. 11, as in the Mecopteran shown in Fig. 10. The slender basal portion of the region proximal to the palpigers *pgr* of Fig. 11 may correspond to the united regions *pm*, *mn* and *sm* of Fig. 10, or the whole

region bearing the labels *pgr* and *pm*, and the proximal parts of Fig. 11, may represent the prementum *pm* alone of Fig. 10. If the latter is the case, the parts have become surprisingly elongated in the Dipteran shown in Fig. 11.

In the flea shown in Fig. 12 the palpi are three-segmented (if I have interpreted Boerner's figure aright), the prementum *pm* is composed of the fused labio-stipes with which the palpigers *pgr* have united, and the region basal to the prementum *pm* represents the mentum *mn*, which, according to Boerner's figure, is demarked from the prementum *pm* in the flea in question. The submentum *sm* is apparently separated from the mentum by a membranous area. In having retained a three-segmented labial palpus, distinct mentum and submentum, the labium of the flea depicted in Fig. 12 is more primitive than that of any Mecopteran or Dipteran I know of, and this may be taken to indicate that the Siphonaptera, or fleas, branched off from the common Mecopteran-Dipteran stem at a phylogenetically early period. At any rate, it would be very difficult to derive the type of labium shown in Fig. 12 from that of any known Dipteran or Mecopteran; and I very seriously doubt that the Siphonaptera are to be derived from the Diptera themselves, and I prefer to derive them from the common ancestors of the Diptera and Mecoptera, although the line of development of the fleas has paralleled that of the Diptera very closely.

I am well aware that the foregoing interpretation of the parts of the labium of the Diptera in particular is quite at variance with that proposed by Peterson, 1916, and again affirmed by Otanes, 1922, who however, exhibits a surprising lack of familiarity with the condition occurring in the Diptera, and in the orders related to the Mecoptera, in his paper on Mecopterous mouthparts; and in criticizing the interpretations of the parts given by Crampton, 1921, it is unfortunate that Otanes did not avail himself of the information given in the paper he attempts to criticize, else he might have avoided many of his mistakes—for which a lack of familiarity with forms related to the Mecoptera is apparently responsible.

Otanes claims that the prementum *pm* of Figs. 3 and 10 is present only in the Mecoptera, and using this as an excuse to discard the term prementum, applied to the sclerite in question in the Mecoptera and allied insects by Crampton, 1921, he dubs the prementum the "mecoglossa." Now the Greek word *mekos* (or *mecos*) signifies *length*, and if the term "mecoglossa" has any meaning at all, it refers to a *long* glossa—but the glossa has become atrophied and utterly disappears in all Mecoptera, so that it is rather amusing to find the appropriate term prementum discarded, and as a substitute for it, to have the term "mecoglossa," signifying "long glossa," applied to a region which has nothing to do with the glossa, in insects in which the

glossa has been completely lost through atrophy! Furthermore, the prementum *pm* is not restricted to the Mecoptera (Figs. 3 and 10), as Otanes would have seen, had he extended his studies to other forms as well as the Mecoptera, since the flea shown in Fig. 12 has a well marked prementum *pm*, the Dipteran shown in Fig. 1 also has a prementum *pm*—as is likewise true of the Dipteran shown in Fig. 4 (where the prementum bears the label *pm*); and in the Neuropteran shown in Fig. 9, and the Coleopterian shown in Fig. 8, the region labeled *pm* (which is composed largely of the palpigerae *pgr*) is homologous with the prementum *pm* of the Mecoptera shown in Figs. 3 and 10. Likewise, in the Coleopterous larva shown in Fig. 5, the ligula *li* has become greatly reduced, and the palpigerae have united with the fused labiostipites to form the prementum *pm* homologous in every way with the prementum *pm* of the Mecoptera shown in Figs. 3 and 10; so that there is absolutely no basis for Otanes' claim that the prementum (or his "mecoglossa") occurs only in the Mecoptera, and his attempt to substitute the term "mecoglossa" for prementum on these grounds, is as ill advised as his choice of a designation for the structure in question.

Otanes criticizes Crampton, 1921, for designating as the palpigerae the structures labeled *pgr* in Fig. 3 of the present paper on the ground that there is supposedly no suture demarking the palpigerae *pgr* in *Panorpa lugubris* (Fig. 3), the structures in question being separated merely by a broad, secondarily formed depression, according to Otanes. Otanes claims to have "examined numerous specimens of the labium of *Panorpa lugubris*" without being able to find a suture dividing the palpigerae, but if he had looked a little more discerningly he would have discovered that in this insect not merely a suture, but a distinct cleft, divides the palpigerae *pgr* distally (as shown in Fig. 3), while the basal portions of the palpigerae are clearly demarked from the slender median region which represents the united labiostipites, and to the bases of the palpigerae are attached the typical palpigeral tendons labeled *pgt* in Fig. 3, which are attached to the bases of the palpigerae in the Coleoptera (*Harpalus* and other beetles) and other forms, as is known by every student who has taken a course in insect morphology. If Otanes could not see the huge cleft between the distal portions of the palpigerae of *Panorpa lugubris*, however, it is not surprising that he could not see the palpigeral tendons attached to the bases of the palpigerae in this insect, either; but the palpigerae of *Panorpa lugubris* are none the less clearly demarked, and to their bases are attached the palpigeral tendons which clearly signify their true homologies to any student of comparative anatomy. In this connection, it should be noted that when Otanes writes of the "stipulae" of *Panorpa*, he does not mean that this insect has pin-feathers, as the term "stipulae" would indicate, but the

structures he refers to are those designated as the labiostipites by Crampton, 1921.

Otanes claims that the mentum *mn* of the Mecopteran shown in Fig. 3 is not the mentum, but is merely the chitinized distal region of the submentum, and for some reason or other the Mecoptera are supposed to have no mentum. I know of no insect, however, in which the submentum occupies the distal position in which the plate *mn* of Fig. 3 is located, and since the sclerite *mn* of Fig. 3 is situated immediately behind the paraglossae *pgl*, is located distally in the position characteristic of the mentum of other insects, and is just like the mentum of the sawflies and other Hymenoptera in every respect (see also the mentum *mn* of Fig. 12) I fail to see why it is a detached distal portion of the submentum, especially since the submentum is always reduced in the higher Holometabola, as may be seen in Figs. 12, 8, 7, etc. Otanes has thus again based his criticism upon insufficient data, and a wider knowledge of the insects related to the Mecoptera would have enabled him to form a better founded opinion as to the proper interpretation of the parts of the labium and other head structures in the Mecoptera.

Lastly, Otanes states that "the American species of Mecoptera offer no evidence confirmatory of the opinion" upheld by Crampton, 1917-1921, who maintains that the structures labeled *lp* in the Diptera (Figs. 1, 4 and 11) represent the labial palpi, in opposition to the opinion of Peterson, 1916, who claims that the structures *lp* represent the paraglossae in the Diptera. Here again, a more thorough investigation of the subject might have prevented Otanes from falling into a palpable error, for if one compares the American Dipteran *Empis clausa*, shown in Fig. 11, with any American species of *Bittacus*, such as the one shown in Fig. 10, it is perfectly evident that the labial palpi are slender and two-segmented in the Dipteran (Fig. 11) as in the Mecopteran (Fig. 10), and that the palpi are borne at the apices of palpigers *pgr* in the Dipteran (Fig. 11) as in the Mecopteran (Fig. 10), whereas the paraglossae (*pgl* of Fig. 7) are not two-segmented, and are not borne at the apices of the palpigers (*pgr* of Fig. 10), and in addition, the paraglossae exhibit a marked tendency to become atrophied and disappear completely in the forms most closely related to the Diptera, such as the fleas (Fig. 12) and Mecoptera (Figs. 10 and 3).

Tillyard, 1922, correctly designates the structures labeled *lp* in the Dipteran shown in Fig. 1, as the labial palpi, and I do not know of a better specimen for illustrating that the structures in question are two-segmented labial palpi in the Diptera, than the insect shown in Fig. 1. Furthermore, the fact that in certain Mecoptera the labial palpi exhibit pseudotracheae similar to those occurring on the distal segments (labella) of the labial palpi of certain Diptera (although all Diptera do not have

pseudotracheae on the distal segments of the palpi) clearly indicates that the labial palpi of Diptera are such, rather than paraglossae. In fact, I do not see how any one can compare the parts of the Dipterous labium shown in Fig. 1 with those of the Mecopterous labium shown in Fig. 3 without coming to the inevitable conclusion that the structures labeled *lp* in the Dipteran shown in Fig. 1 are the labial palpi and nothing else, for it is so easy to see that the palpigers *pgr* of Fig. 1 are the palpigers *pgr* of Fig. 3, and the two-segmented palpi *lp* of Fig. 1 correspond in every way to the two-segmented palpi *lp* of Fig. 3. If the palpi *lp* of Fig. 1 are the paraglossae, how is it that they are two-segmented (when the paraglossae are not segmented) and are borne at the apices of the palpigers *pgr* in a fashion not occurring in any paraglossae of any known insect? Since no evidence has ever been brought forward to prove that the structures labeled *lp* in Fig. 1 are paraglossae, and since every circumstance clearly indicates that the structures labeled *lp* in Fig. 1 are the labial palpi, the question of the homologies of the labella of the Diptera must be regarded as definitely decided in favor of the view that the labella of the Diptera are the terminal portions of the labial palpi, and unless some actual proof that the labella represent the paraglossae instead, is brought forward in support of the opposite view, further discussion of this question would be merely a waste of time and space which might more profitably be devoted to other subjects.

In several of his papers on the Panorpid "complex" (a term having nothing to do with psychoanalysis) Tillyard is inclined to place the Mecoptera at the base of the Holometabolous stem, on the basis of the nature of the wings of the Mecoptera. This, however, shows the danger of restricting one's phylogenetic studies to one set of structures alone, since not only are the Coleoptera and Neuroptera more primitive than the Mecoptera in their body structures in general, but even the sawflies (which occupy a position intermediate between the Coleoptera and Neuroptera on the one hand, and the Mecoptera and Trichoptera on the other) are more primitively organized than the Mecoptera in having retained an Orthopteroid ovipositor (lost in the Mecoptera) in the females, and a more primitive type of genitalia (with divided penis valves, etc.) in the males, than is the case with any known Mecopteran. The head capsule and mouthparts of sawflies are much more Orthopteroid, and hence more primitive than these structures are in the Mecoptera; the neck and thoracic sclerites, coxae, legs, etc., of sawflies are of a much more primitive (Orthopteroid) type than are those of the Mecoptera, and the same is true of the abdomen with its appendages—the cerci of a sawfly recently given me by Dr. C. P. Alexander having actually retained the multiarticulate condition occurring in certain primitive Isoptera! Even the wings of

sawflies apparently began their type of specialization at a lower "level" than that of the secondarily homonomous wings of the Mecoptera, since the hind wings of certain sawflies show distinct traces of the primitive Orthopteroid anal fan, which all Mecoptera have lost—so that even on the basis of the nature of the wings, the sawflies are of a more primitive type than the Mecoptera are.

As far as the immature forms are concerned, the larvae of sawflies are much more primitive than those of the Mecoptera in the nature of their head capsules and mouthparts; and the retention of a distinct episternum and epimeron in the thoracic region, together with the long, heavily chitinized (and hence more primitive) coxae, and other parts of the leg, and the more primitive type of abdomen, with jointed stylus-like cerci, etc., (which do not occur in Mecopterous larvae) all point to the larval sawflies as being much more primitive than any known Mecopterous larvae, so far as these characters are concerned. Thus the character of the adults, and most larval features, clearly indicate that the Hymenoptera (sawflies) could not possibly be derived from a Mecopterous type of insect, and what is true of the sawflies is much more so of the Coleoptera and Neuroptera which are more primitive than the sawflies themselves! Tillyard's views in this matter are quite untenable, and the ancestral Holometabola were doubtless Neuropteroid forms combining in themselves all of the ancestral characters retained by the primitive Hymenoptera, Neuroptera, and Coleoptera.

Furthermore, the ancestors of the Holometabola were not the Protorthoptera alone, as Tillyard would maintain, since the lines of descent of the Protoblattida and Protorthoptera both parallel the Holometabola; and the Holometabola were apparently derived from the common Protorthopteran-Protoblattid stem (i. e. the "Prodictyoptera") which had still retained certain Palaeodictyopterous features (certain of which are carried over into the Neuroptera as well) from their common ancestry. The lines of descent of the Holometabola are therefore shown in Fig. 6 as though branching off from the common Protorthopteran-Protoblattid stem, but for the sake of simplicity, the lines of descent of the Isopteroid, Orthopteroid, and Plecopteroid forms which cluster about the base of the Holometabolous stem are not shown in the diagram—although the line of descent of the Psocids, which parallels that of many of the Holometabola, is indicated in the figure, since the Psocids branched off from the common Protorthopteran-Protoblattid stem at the point at which the lines of descent of the Holometabola arose from this same stem.

A study of other parts of the body in general, rather than the labium alone, would indicate that the Coleoptera and Neuroptera are the lowest representatives of the Holometabola (as is

shown in the diagram in Fig. 6), and while the Coleoptera are very closely related to the Neuroptera, they represent a rather aberrant group whose line of descent leads off along its own path of specialization. The Hymenoptera, which occupy a position somewhat intermediate between the Trichoptera and Mecoptera on the one side, and the Coleoptera with the Neuroptera on the other, are as nearly related to the Coleoptera as to any other lower Holometabola (the lower Holometabola are the Coleoptera, Neuroptera and Hymenoptera—and possibly the Strepsiptera also—while the higher Holometabola are the Mecoptera, Diptera, Siphonaptera, Trichoptera and Lepidoptera) and the character of the labium would indicate that the Hymenoptera are closely related to the Coleoptera, and that the Hymenoptera, Coleoptera and Neuroptera are the lowest Holometabolous types.

The tendency for the palpigera (with their palpi) to become approximated mesally occurs in some lower Holometabola (Figs. 7, 8, and 9) as well as in the higher Holometabola (Figs. 10, 11 and 12), and even the tendency for the ligula to become atrophied is exhibited by some lower Holometabola (e. g. Fig. 2), while some lower Holometabola likewise exhibit a tendency for the submentum to unite with the mentum, or for the proximal portions of the labium to become long and slender (as in Fig. 2), so that the principal modifications of the labium of the higher Holometabola are so to speak presaged in the lower Holometabola, which must therefore contain the same tendencies which find opportunity for fuller development in the higher Holometabola. These, and many other features have led me to believe that the usually accepted view that the Holometabola form a natural group is the correct one, despite the fact that I formerly considered that complete metamorphosis might have arisen independently, and that the Holometabola were not necessarily a natural assemblage of insects.

A study of the labium of the higher Holometabola would indicate that the Diptera and Mecoptera are extremely closely related (as is indicated by many other features as well), and that the Siphonaptera are related both to the Diptera and to the Mecoptera, as is shown in Fig. 6. The Trichoptera as well as the Mecoptera have retained many features characteristic of the ancestors of the Diptera, but the labium does not show this as well as might be desired in the material which I have at my disposal, nor does the available material serve to indicate that the Trichoptera are related to the Mecoptera, and parallel the Lepidoptera extremely closely (as indicated in Fig. 6), although I am hoping to obtain the necessary Trichopterous material to fill out the series, in order to complete the study of the labium in all of the orders of insects—which is complete save for the labium of the Trichopterous forms—and I would make use of this

opportunity to ask that any one who has primitive Trichoptera preserved in fluid, would lend me the desired material long enough to make a sketch of the mouthparts of the insects in question.

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 TILLYARD, 1922 Australian Blepharoceridae. Austr. Zool. II, p. 159.

ABBREVIATIONS.

- dgl* —Distiglossa ("labellum" of bee).
gl —Glossa (so called in bee).
gu —Gula.
li —Ligula.
lo —Lora.
lp —Labial palpi (labella of Diptera).
mn —Mentum.
pgl —Paraglossae.
pgr —Palpigers.
pgt —Palpigeral tendons (Palpigertendons).
pl —Palpal lobes (Palpilobi).
pm —Prementum.
sm —Submentum.

EXPLANATION OF PLATE XV.

All figures depict the posterior (ventral) surface of the labium.

- Fig. 1—Distal portion of labium of Dipteran *Edwardsina*, sp.
 Fig. 2—Labium of Coleopteran *Lycus* sp.
 Fig. 3—Labium of Mecopteran *Panorpa lugubris*.
 Fig. 4—Distal portion of labium of Dipteran *Asyndulum montanum*.
 Fig. 5—Labium of larval Coleopteran *Hydrophilus* sp.
 Fig. 6—Lines of descent of principal Holometabolous insects.
 Fig. 7—Labium of Hymenopteran *Bombus* sp.
 Fig. 8—Labium of Coleopteran *Rhipiphorus dimidiatus*.
 Fig. 9—Labium of Neuropteran *Nemoptera sinuata*.
 Fig. 10—Labium of Mecopteran *Bittacus* sp.
 Fig. 11—Labium of Dipteran *Empis clausa*.
 Fig. 12—Labium of Siphonapteran (flea) *Pulex serraticeps*, after Boerner, 1903.

TWO SERPHOID GUESTS OF ECITON¹ (HYM.).

By WM. M. MANN, *Bureau of Entomology.*

Among a large series of Ecitophiles taken along the Rio Beni in Bolivia are two Serphoids. One of them is a known species, the other appears new and a description follows.

Notoxopria cornuta, new species.

Female.—(Fig. 1a.) Length 3 mm.

Color brownish red, gaster, antennae and tibiae darker; moderately shining; thorax, abdomen and legs reticulately punctate; head smooth and more shining. Pilosity moderately abundant, yellow, long and erect on body, shorter and oblique on legs and scape, much shorter on funiculus.

Head in profile a little longer than deep; seen from above suboval, surface evenly convex except for a setose tubercle near the hind margin of eye; front strongly oblique and flattened; antennal fossa margined, the anterior margin projected as triangular tooth at middle, the posterior border with three shorter, blunt triangular teeth. Ocelli large, rather prominent, arranged in a triangle. Eyes convex, nearly as long as cheeks. Antennal scapes longer than head; second funicular joint nearly as long as first and third together; joints 4–10 gradually decreasing in length, the 10th one one-half times as broad as long; terminal joint much shorter than the two preceding together.

Pronotum projected obliquely over the head as a cylindrical horn, longer than high and strongly, vertically excised on its apical surface. Mesonotum truncate behind, narrowly rounded in front, its surface feebly convex, except near sides of basal half where it is feebly impressed. Scutellum convex, its posterior border

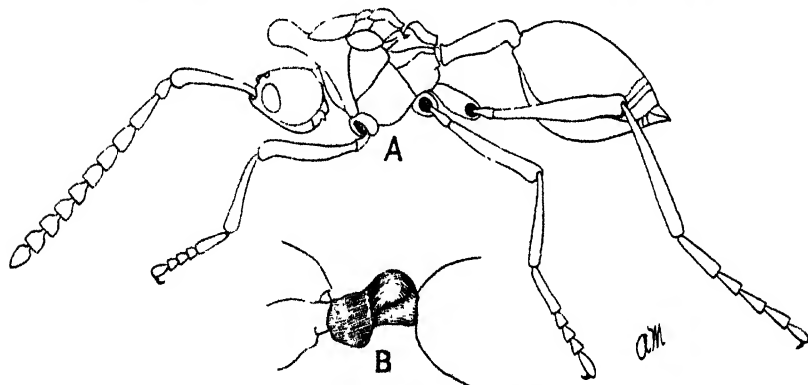


FIG. 1.—*Notoxopria cornuta*, new species.
a.—Female from side. b.—Petiole of male.

broadly concave. Metanotum in profile convex, a little longer than high, margined along posterior border, the margins terminating in short, triangular teeth. Petiole from above narrow in front, with nearly parallel sides for five-eighths its length, then impressed and behind the impression enlarged, the

¹Results of the Mulford Biological Exploration. Entomology.

posterior portion with subconical sides; in profile about three times as long as broad, slightly thickened posteriorly, then constricted, nearly straight above, convex behind middle beneath. Abdomen shorter than thorax, pointed behind. Legs long, femora moderately enlarged apically; intermediate coxae with a small, acute spine on ventral surface.

Male.—(Fig. 1-b.) Differing from the female in having the gaster deeper, more narrowly rounded beneath and with the first ventral segment rather strongly and broadly impressed at middle. The petiole is entirely different, divided by a strong impression into two portions, the anterior of which in profile is slightly shorter than the other and set on a lower plane, convex beneath and straight above; from above, very small, triangular, narrowest posteriorly; the posterior portion in profile is slightly higher than long, rounded above, concave beneath, with a rather strong diagonal margin separating the upper and lower portions; from above it is four times as broad as the anterior portion, twice as broad as long, with the anterior border nearly straight, sides strongly and posterior border broadly rounded.

Cavinas, Beni, Bolivia (Type locality); Tumüpassa.

Host.—*Eciton legionis* F. Smith subsp. *crenulatum* Mann.

Type and Allotype.—Cat. No. 26483 U. S. N. M.

This species differs from *N. rufa* Kieff., described from Marcapata, Peru, with no note to indicate myrmecophilous habit, in the entire absence of wings. Kieffer had before him only specimens with elongate petiole which he considered females, and I am following him in this.

One specimen was taken from each of two colonies and twenty of both sexes from a third. Like the following species, *N. cornuta* runs in the ant column, apparently in frantic haste, and I did not observe the ants pay any attention to it. One may assume that both are parasitic on the ant larvae.

***Mimopria ecitophila* Holmgren.**

Rio Beni, Bolivia. Rurrembaque, Little Rio Negro, Cavinas, Cachuela Esperanza.

Host.—*Eciton hamatum* Linn.

This seems to be usual in the files of *hamatum*, never abundant in a single column, but to be found in nearly every one examined. It has now been recorded from Peru, Bolivia and Brazil and probably extends throughout the range of its host.

**TWO NEW CONOTRACHELUS FROM TROPICAL FRUITS.
(COLEOPTERA, CURCULIONIDAE.)**

BY H. S. BARBER.

Quantities of fallen fruit of aguacate or avocado, *Persea persea* (Linn.) Ckl. lying on the ground under the trees at Huascata (near Yurecuaro, about 70 miles east of Guadalajara), Jalisco, Mexico, in May, 1923, were found by Dr. Wm. M.

Mann to contain large numbers of rhynchophorous larvae. He reported the fruit as "badly infested by weevils which have destroyed a large percentage of this year's crop" and took a sample of larvae from the fruit, placing them alive in earth, in an earthen pot which he handed to the writer on his return to Washington. Sixteen adults of an apparently undescribed species of *Conotrachelus* issued during the summer, and the resulting specimens, although allied to *C. perseae* and *serpentinus*, considered in a former paper by the writer, 1919 (Proc. Ent. Soc. Wash. vol. 21, pp. 55-58), display very distinctive characters. These three species breeding in the fruit of *Persea* spp. are externally similar and although readily distinguishable on secondary sexual characters supported by habitus and locality data, might be considered as varieties, except that the aedeagi are so different in form that even were habitat and sex stimuli to permit the attempt, cross-matings would appear to be mechanically prohibited. The aedeagi of the three species are here shown;—*aguacatae* n. sp. (type) from Jalisco, *serpentinus* Boheman from Cuba, and *perseae* Barber (type) from Guatemala.



FIG. 1.—Aedeagi of *Conotrachelus* in *Persea* spp.

While attempting to identify these specimens with species already described, two specimens of a beautiful species of the same genus were submitted for determination, with the information that they had been reared from larvae boring galleries in the flesh around the seed of the sapodilla or "zapote," *Achras sapote* Linn., causing considerable damage and rendering the fruit worthless for market. Prof. Stephen C. Bruner, who reared the specimens, stated further that they had thus far been found at only one place, near Havana, Cuba, that the species is not represented in the Gundlach Collection nor previously in the

collection of the Estacion Experimental Agronomica and that it is the only insect of real economic importance known to him as attacking the sapodilla in Cuba. This may indicate recent introduction from another island or from the mainland but the unsatisfactory condition of the literature on South American weevils precludes its identification at present other than by here considering it as new and it is described below as *Conotrachelus sapotae* n. sp.

Conotrachelus aguacatae, n. sp.

Narrowly elongate, castaneous the pronotum darker, shining, sparsely coarsely punctate with coarse decumbent fulvous to ochreous hairy vestiture of slightly uneven density on elytra; alternate elytral intervals feebly costate; femora obsoletely annulate. Pronotum subconical, more than three-fourths as long as wide, five-eighths as wide in front as at base, sides feebly arcuate, median carina not strongly expressed. Elytra widest at humeri, two-thirds as wide as long, sides nearly straight and strongly convergent posteriorly to apical fourth, humeri obtusely, sub-angulately rounded; striae punctures large, remote, the suture elevated and the 2d, 4th and 6th interstices costate.

♂; Hook on apex of anterior tibiae small, simple, concealed in tuft of short hair; rostrum passing middle coxae, pubescent in basal two-thirds, antennae inserted at apical fifth; metasternum tumid laterally, strongly impressed between hind coxae and with oblique carinae connecting meso- and metacoxae; last abdominal sternite broadly shallowly impressed at middle; aedeagus with thin, narrow, very strongly recurved apical process. (Fig. 1.)

♀; Rostrum scarcely longer than in the male, with scaly vestiture in basal half, antennae inserted at apical fourth.

Length 5.5-6.3 mm., width 2.6-3 mm.; rostrum 1.6-1.9 mm.

Type, allotype and paratypes no. 26583 U. S. N. M.

Described from twelve mounted specimens reared by the writer from larvae in young avocado fruit collected at Huascata, Jalisco, Mexico, by W. M. Mann in May, 1923, five other tender or decayed specimens from the same lot being preserved in alcohol with larvae and pupae.

This species is very closely related to *C. perseae* Barber 1919, but differs in being smaller, relatively narrower, with much sparser vestiture and coarser sculpture, in the absence of the peculiar impression of the metasternum with its concomitant peculiar, arcuate ridge along its posterior margin and most strikingly in the shape of the produced and recurved apex of the aedeagus as shown in the figure. The basal tooth on the inner surface of the tarsal claws is shorter and stouter in *aguacatae*, and the hind femora less incrassate than in *perseae* or *serpentinus* although the femoral teeth are similar.

Conotrachelus sapotae, n. sp.

Elongate oval; sub-opaque; dark castaneous; densely clothed with fine, appressed scale-like vestiture mostly white in color, but with areas of rose-red

squamae forming conspicuous red spots on sides of pronotum in front, on elytral disc (produced sub-basally to humeri and posteriorly to beyond middle of elytra occupying median third in width) a conspicuous small red area nearly surrounded by a denuded area near apices of elytra and a red patch on femora at apical fourth, vestiture absent in small basal area below humeri and at sides of elytra in median half of length below humeral costa, the white scales narrower and less densely placed in median third of pronotum. Pronotum widest at middle, sides strongly arcuate, posteriorly parallel (♂) or slightly convergent (♀), anteriorly strongly convergent; median carina shining and conspicuous in anterior two-thirds. Elytra widest at humeri which are not prominent but only obtuse-angulate, sides parallel in basal third, evenly rounded posteriorly; striae very feebly impressed, the 2d, 4th and 6th interstices obsoletely tuberculate. Mesosternum very prominent, produced anteriorly into a transverse subconical lobe and clothed with numerous white hairs. Metasternum not impressed at middle, posteriorly prominent before hind trochanters, sparsely foveolate, with short white scale-like hairs, abdominal segments finely, shallowly punctate with fine sparse white scales. Tarsal claws small, simple.

♂; Rostrum passing middle coxae, strongly punctate, the punctures forming striae on each side of basal median carina and supporting fine white hairs to beyond middle; antennae inserted two-fifths from apex; basal abdominal segments shorter and more deeply impressed at joints.

♀; Rostrum moderately curved, reaching 1st abdominal segment, round, shining, sparsely punctulate, without hairs at base; antennae inserted at middle.

Length ♂ 5.7, ♀ 5.5-6.1 mm.; width ♂ 2.9, ♀ 2.7-3.1 mm.; rostrum ♂ 2.4, ♀ 2.4-2.8 mm.

Type and allotype and one ♀ paratype no. 26584 U. S. N. M.

Two female paratypes returned to S. C. Brunner.

Described from five specimens reared by Mr. S. C. Brunner at Santiago de las Vegas, Cuba, from larvae boring tunnels through the flesh of *Achras sapota* Linn., on a farm near San Miguel del Padrón, Habana Province. In the largest female irregular small areas of red scales are scattered in the white scale area in basal three-fifths of elytra.

TYPES OF TWO CHALCID-FLIES MISIDENTIFIED.

By A. B. GAHAN, *Bureau of Entomology.*

It is desired herewith to correct two unfortunate instances of erroneous synonymy published by the writer. In both instances the errors were directly due to misidentification of type specimens.

I. In Proc. Ent. Soc. Wash., vol. 20, 1918, p. 66, a note regarding the genus *Propachyneuronia* Girault was published in which the statement was made that the genotype species, *Encyrtus siphonophorae* Ashmead, was a composite species and that the true type was an Encyrtid belonging to the genus

Aphidencyrthus where Ashmead had later placed it, instead of a *Pachyneurine* as Girault had stated.

This conclusion was based on specimens in the national collection bearing the type number 4860 which is the number assigned to the species in the type book, (not 4761 as recorded by Ashmead, Proc. U. S. Nat. Mus., vol. XII, 1900, p. 399). These specimens were naturally taken to be the actual types without further verification and since they certainly belonged to *Aphidencyrthus* the conclusion was drawn that Girault had been mistaken in the identity of the type specimens. Unfortunately I failed to take account of the fact that the specimens bearing the type number also bore a folded label stating that they had been reared at "Washington, D. C., Aug. 15 and 22, 1894, from *Siphonophora liriodendri*," and thus were shown to have been reared eight years subsequent to publication of the description and were from a different host and locality from that stated for the types in the original description. In the light of this label it is obvious that these specimens can not be the types. Girault in 1915 (Ann. Ent. Soc. Amer., vol. VIII, p. 283) where he synonymized *Aphidencyrthus aphidiphagus* Ashmead and *A. siphonophorae* Ashmead, evidently fell into the same error of accepting these specimens as types, a fact which he does not mention in his later treatment of the species.

The specimens upon which Girault based his later (1917) identification of the species and which formed the basis for his genus *Propachyneuronia* are labelled "*Pachyneuron siphonophorae* Ashmead" in Ashmead's handwriting with the name "*Encyrthus*," also in Ashmead's hand, written in one corner of the label and are from Jacksonville, Fla. The collection apparently contains no other specimens which could be the types and since these specimens fit Ashmead's description it seems certain that they are the actual types of *Encyrthus siphonophorae* and they have been so labelled.

In view of the foregoing the synonymy indicated in my previous note requires correction. Also it becomes necessary to amend to some extent the synonymy as given in the recently published list of type species of the genera of Chalcidoidea by Gahan and Fagan (U. S. Nat. Mus. Bul. 124, 1923, pp. 14 and 121). *Encyrthus aphidiphagus* Ashmead and *Encyrthus siphonophorae* Ashmead are not the same species and therefore *Aphidencyrthus* Ashmead and *Propachyneuronia* Girault are not isogenotypic, the latter genus being instead a synonym of *Pachyneuron* Walker in the opinion of the writer.

The corrected synonymy is as follows:

***Pachyneuron* Walker.**

Pachyneuron Walker, Ent. Mag., vol. I, 1833, pp. 371 and 380.

Propachyneuronia Girault, Psyche, vol. XXIV, 1917, p. 102.

Propachyneuronia (Girault) Gahan and Fagan, U. S. Nat. Mus. Bul. 124, p. 121.

***Pachyneuron siphonophorae* (Ashmead).**

(*Eupelmus*) *Encyrtus siphonophorae* Ashmead, Trans. Amer. Ent. Soc., vol. XIII, 1886, p. 131.

Pachyneuron aphidivora Ashmead, U. S. Dept. Agr. Div. Ent., Bul. 14, 1887, p. 14.

Pachyneuron maidaphidis Ashmead, Fla. Agr. College Bul. 2, 1888, p. 23.

Pachyneuron micans Howard, Insect Life, vol. II, 1890, p. 247; fig. 51.

Aphidencyrtus siphonophorae Ashmead, Proc. U. S. Nat. Mus., vol. XII, 1900, p. 399.

Propachyneuronia siphonophorae Girault, Psyche, vol. XXIV, 1917, p. 102.

Genus *Aphidencyrtus* Ashmead.

Aphidencyrtus Ashmead, Proc. U. S. Nat. Mus., vol. XII, 1900, pp. 340 and 398.

Propachyneuron Gahan, Proc. Ent. Soc. Wash., vol. 20, 1918, p. 66; Gahan and Fagan, U. S. Nat. Mus. Bul. 124, 1923, pp. 14, 120 and 121. (Misidentification of *Propachyneuronia* Girault.)

***Aphidencyrtus aphidiphagus* Ashmead.**

Encyrtus aphidiphagus Ashmead, U. S. Dept. Agr. Div. Ent., Bul. 14, 1887, p. 14.

Aphidencyrtus aphidiphagus Ashmead, Proc. U. S. Nat. Mus., vol. XII, 1900, p. 399.

Aphidencyrtus siphonophorae Girault (not Ashmead), Ann. Ent. Soc. Amer., vol. VIII, 1915, p. 283.

Aphidencyrtus siphonophorae Gahan (not Ashmead), Proc. Ent. Soc. Wash., vol. XX, 1918, p. 66.

(*Encyrtus*) *Aphidencyrtus siphonophorae* Gahan and Fagan (not Ashmead), U. S. Nat. Mus. Bul. 124, 1923, p. 14.

II. In 1920 (Proc. Ent. Soc. Wash., vol. 22, p. 239) (*Pteromalus*) *Meraporus calandrae* Howard was listed by me as a synonym of *Lariophagus distinguendus* (Foerster) the conclusion being based upon specimens in the national collection bearing the name label and at that time supposed to be the types. Following this publication Mr. James Waterston of the British Museum in correspondence and later in his "Report on Parasitic Hymenoptera Bred from Pests of Stored Grain" called attention to certain particulars in which Howard's original description of *calandrae* failed to agree with *distinguendus*. A careful checking up of the type was accordingly undertaken with the result that a pin from which the specimen had disappeared but which bore the label "*Pteromalus calandrae* Howard, MS, from *Calandra orizae*, Aug. 11, 1880," and the type label No. 2743 was discovered misplaced in the collection. There can be no doubt that this pin originally carried the type specimen of *Pteromalus calandrae* Howard which was described from a single male and that the specimen which I previously considered to be

the type was not that. The actual type specimen has completely disappeared as already indicated. The original description must, therefore, be depended upon to fix the identity of *calandrae* Howard.

This description agrees in every detail with certain male specimens of *Aplastomorpha vandinei* Tucker, a species which, like *calandrae*, was originally recorded from Texas as a parasite of *Calandra oryzae*. There appears no reason to doubt that *calandrae* Howard and *vandinei* Tucker are the same species. The former name is the older and should have precedence. The corrected synonymy is as follows:

***Aplastomorpha calandrae* (Howard).**

- Pteromalus calandrae* Howard, Rept. U. S. Dept. Agri., 1880-1881, p. 273.
Meraporus calandrae Ashmead, in Smith's Ins. N. J., 1900, p. 558.
Meraporus calandrae Pierce, Jr. Econ. Ent., vol. I, 1908, p. 384.
Meraporus vandinei Tucker, Can. Ent., vol. 42, 1910, p. 343.
Aplastomorpha pratti Crawford, Proc. U. S. Nat. Mus., vol. 47, 1913, p. 252.
Neocatolaccus australiensis Girault, Mem. Queensl. Mus., vol. II, 1913, p. 306.
Aplastomorpha australiensis Girault, Mem. Queensl. Mus., vol. III, 1915, p. 313.
Neocatoluccus vandinei Girault, Ins. Ins. Mens., vol. 5, 1917, p. 152.
 ?*Pteromalus calandrae* Bridwell, Proc. Haw. Ent. Soc., vol. III, 1917, p. 488.
Neocatolaccus vandinei Girault, Treubia, vol. I, 1919, p. 59.
 ?*Pteromalus calandrae* Bridwell, Proc. Haw. Ent. Soc., vol. IV, 1919, p. 19.
Meraporus vandinei Gahan, Proc. U. S. Nat. Mus., vol. 56, 1919, p. 523.
Meraporus calandrae Doane, Jr. Econ. Ent., vol. 12, 1919, p. 312.
Aplastomorpha vandinei Gahan, Proc. Ent. Soc. Wash., vol. 22, 1920, p. 239.
Aplastomorpha vandinei Waterston, 9th Rept. Grain Pests Com., 1921, p. 17 (Royal Soc. Lond.).

THE RASPBERRY CANE APHID (HOM.).

By P. W. MASON, U. S. Bureau of Entomology.

This description was first prepared for a monograph of the Genus *Amphorophora*, and tables of measurements and drawings will appear in that monograph. In view of the increasing interest in the raspberry aphids and their possible relation to the transmission of mosaic, it is thought advisable to publish an account of this species in advance of the monograph.

The species is commonly known as the cane aphid, in distinction to *Amphorophora rubi* Kalt. which is found on the leaves. It seems to be rather common on this continent and has no doubt often been confused with *rubi* Kalt. As far as is known it is not found in Europe, the type continent of *rubi* Kalt.

It is distinguished from *rubi* Kalt., by the sensoria on antennal segments IV and V of the alate, by the larger number of sensoria on segment III in both the alate and apterous forms,

by the shorter cornicles and by the smaller number of hairs on the cauda.

This is the species which Gillette had when he wrote (Jl. Ec. Ent. IV, 1911, p. 381) "A very similar species taken by Mr. Bragg at Lawrence, Kansas, differs by having cornicles decidedly shorter and having joint 4 of the antenna in the alate viviparae well set with sensoria." Dr. Gillette kindly lent me this slide for study.

***Amphorophora sensoriata*, n. sp.**

Alate Viviparous Female.—Antennae longer than body, dark colored, imbricated, hairs inconspicuous, much shorter than width of segments. Average length of segments; III 1.066 mm., IV 0.808 mm., V, 0.544 mm., VI 0.177 + 0.9424 mm. The sensoria range on III from 49 to 82, on IV from 20 to 47, on V from 0 to 5. Antennal tubercles large. Beak short, in some specimens not reaching the second coxae. Average width of head across eyes 0.521 mm. Cornicles fairly long, moderately swollen, the tips imbricated but not reticulated. Average measurements: length 0.540 mm., widest diameter 0.072 mm.; smallest diameter 0.040 mm.; flange 0.048 mm. Average length of cauda 0.272 mm.; broad, not constricted, with about three sets of lateral hairs.

The following color notes were made by Pergande from the specimens which are made the type of the species:

"Color of abdomen of migrant light to dark bluish green and highly polished; head and thoracic and sternal plate yellowish brown, the sutures of the lobes more or less black; disk of prothorax very pale brownish, darkest along its posterior margin; eyes reddish brown; ocelli bordered with black at inner margin; antennae black; legs black, the femora brownish yellow at base; nectaries black, greenish at base; tail greenish, or yellowish green; wings colorless, subcosta brown or yellowish brown, stigma dusky, veins black, those of stigmal vein and branches of third slightly clouded at tip."

Apterous viviparous Female.—Antennae about a third longer than the body, imbricated, the hairs inconspicuous, much shorter than the width of the segments, segment III with a row of 23 to 34 sensoria, other segments without secondary sensoria. Average measurements of segments, III 1.104 mm., IV 0.826 mm., V 0.564 mm., VI 0.178 + 0.876 mm. Antennal tubercles large. Beak reaching about to second coxae. Average width of head across eyes 0.530 mm. Cornicles moderately long, plainly swollen, the tip imbricated, but not reticulated. Average measurements: length 0.598 mm., widest diameter 0.082 mm., smallest diameter 0.040 mm., flange 0.048 mm. Average length of cauda 0.288 mm., broad, conical, not constricted, with about three sets of lateral hairs.

Pergande left the following color notes of the type specimen.

"Apterous female pale bluish green; antennae black, the two basal joints and front edge of head brownish yellow, eyes brown, legs yellowish brown, the base of femora very pale bluish green; nectaries dusky, paler at base, tail of color of body."

Intermediate.—Similar to other forms, except for very small wings, larger on left side, and for the number of sensoria, segment III having 37 on one side and 39 on the other, IV having 5 on each antenna. No ocelli present. Average

measurements: III, 1.152 mm., IV 0.880 mm., V 0.552 mm., VI $0.192 + 0.808$ mm., width of head across eyes 0.496 mm., length of cornicles 0.640 mm., widest diameter 0.080 mm., smallest diameter 0.040 mm., flange 0.048 mm., cauda 0.036 mm.

Described from nine alate females, five apterous and one intermediate vivipara.

Distribution.—Massachusetts, Pennsylvania, Maryland, District of Columbia, Virginia, West Virginia, Ohio, Kansas and Minnesota.

Host.—*Rubus*.

Type.—Deposited in the U. S. National Museum No. 26379. Cotype slides in the National Museum and in the collection of Dr. Thos. L. Guyton.

Biology.

I have found this species sparingly on the stems of raspberry, never on the leaves. It sometimes is down very close to the ground. Pergande says in his notes "Found on stems of *Rubus*, which they sometimes covered for a distance of several inches. Drop readily, if disturbed." I have examined specimens taken June 26, 1903, in Virginia (type); July 11, 1903, in Minnesota, June 30, 1905, in the District of Columbia, July 10, 1919, in West Virginia, June 20, 1920, in Pennsylvania, Sept. 20, 1921, in Maryland and Sept. 13, in Massachusetts. It will be observed from this that there are no records for the latter part of July, August and the first part of September. The species may migrate to an alternate host during this time although it is probable that at least a few remain on *Rubus* throughout the year.

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A CHANGE OF NAME IN BUPRESTIDAE.

By W. S. FISHER, *Bureau of Entomology*.

In the (Proc. U. S. Nat. Mus., vol. 62, 1922, Art. 8, pp. 4-5) I described a species of this family under the name of *Trachys cyanipennis*, but find that I previously used this same name for a species of this genus from the Philippine Islands (Philip. Jour. Sci., vol. 18, 1921, pp. 429-430). This error was caused by not having a copy of my manuscript when my later paper was written, therefore I would propose the new name *Trachys panamaensis* for the species from Panama.

Actual date of publication, January 25, 1924.

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ERRATA.

Page 147, line 12.—Read "26,898" instead of "26,908."

Page 147, line 12.—From bottom: Read "*trivittatus*" for "*trivittata*."

Page 151, between lines 12 and 13 from bottom.—Insert "Iowa (Wickham)."

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JANUARY 1924

No. 1

ON THE NYMPHS OF THE APHIDINAE.

BY RHYOICHI TAKAHASHI, *Government Research Institute, Taihoku, Formosa.*

As the study of the immature stages of the family Aphididae has been practically neglected, I shall give in the following a general summary of the results of my studies on the nymphs of Aphidinae.

ECDYSIS.

The aphids, whether winged or wingless, usually moult four times and have, as a rule, four nymphal instars, but there are some exceptions. Davis records a case where a wingless form of *Aphis maidi-radici* Forbes gave birth to six young, then moulted, became winged, and produced twenty-one more. According to Haviland, *Myzus ribis* L. sometimes shows a fifth moult subsequent to the birth of young; and it is claimed that an occasional fifth moult has likewise been noticed in *Macrosiphum pisi* Kalt. Kadomai observed that a moult took place after the birth of young in *Eriosoma lanigera* Hausm.

The moulting after sexual maturity observed in some aphids is known to occur in *Collembola* also, but not in other insects. Like *Collembola* the aphids are not provided with malpighian vessels, being in this respect unlike all other insects. This is in support of the theory that ecdysis perhaps has an excretory importance besides a provision for growth.

Ewing obtained what he called paedogenetic nymphs of *Rhopalosiphum avenae* Fab., but they were intermediates, adults between the winged and wingless condition, as pointed out by Baker. Paedogenesis does not occur in Aphididae. The number of moults is scanty in the sexes of *Pemphigus*, *Tetraneura*, *Eriosoma*, etc., as well as in the males of *Stomaphis*. These sexual forms are always apterous, with the rostrum rudimentary.

I have found that the apterous forms of the genera *Oregma* and *Astegopteryx* moult only three times, while their winged forms moult four times, the usual number for species of this family. The apterous forms of *Lachnus thujafoliae* Theob. also seem to have three nymphal instars. Pergande records three instars for the wingless forms and four instars for the

winged in *Hamamelistes spinosus* Shimer and *Hormaphis hamamelidis* Fitch.

According to Fuller, the apterous workers and soldiers of a termite community pass through fewer stages of growth than do their corresponding winged imagoes. Some apterous species of Gerridae and Veliidae have been recorded to have three or four nymphal instars, though five instars are common for heteropterous insects. In my opinion, these facts indicate that the apterous forms of paurometabolous insects have a tendency to fewer moults than the winged forms, a tendency due perhaps to the simplicity of body structure in the apterous forms.

MORPHOLOGY

With special reference to the metamorphosis.

As is well known, the postembryonic development of these insects is paurometabolous, and the structural differences between the young and full-grown nymphs are more distinct than those between the full-grown nymphs and the adults, especially so in the apterous forms, as in many other insects of Paurometabola. Each of the nymphal instars displays as a rule structural characters sufficient for the identification of the particular instar that it represents, but in *Shivaphis celti* Das, *Greenidea* and *Dilachnus* the third and fourth instars of the wingless form are scarcely different in structure from each other.

Aleyrodiform females of Hormaphidina.—As the metamorphosis of the aleyrodiform females of some genera of Hormaphidina, *Astegopteryx*, *Hamamelistes*, *Hormaphis* and *Cerataphis*, is very peculiar, it will be considered first.

The adults are very hard, almost black and aleyrodiform, and are firmly cemented to the host. In the first instar, the nymphs are pale in colour, due to the weaker pigmentation of the chitin. They are provided with well-developed legs and 3 or 4-jointed antennae and crawl over the host. In the second instar, they become stationary, have reduced antenna (often 2 or 3-jointed); the front and middle pairs of legs lack tarsi, and the hind legs are provided with single jointed tarsi, without claws. In the third or the last instar, the body becomes broader and the antennae more reduced; legs remaining almost as in the preceding instar. This metamorphosis very closely resembles that of some female Coccidae.

Other Aphidinae.—In the young nymphs, the body is often rather flattened, with the abdomen narrow. In the dimorphs or the first instar of *Periphyllus* specialized for aestivation, it is quite depressed and thin. The head is usually larger in proportion to the size of body in the young nymphs than in the

grown ones or adults. It is completely fused together with the pronotum in the genera *Cerataphis*, *Oregma*, *Astegopteryx*, *Aleurodaphis*, *Cervaphis*, *Neophyllaphis*, *Greenidea*, etc., except in the fourth instar and adults of the winged form. The dorsal surface of the head of some Lachnina (*Lachnus*, *Eulachnus*, etc.) is divided, though not distinctly so, by a longitudinal line which is distinguishable even in the first instar. In the nymphs of *Neophyllaphis podocarpi* Takah. it is likewise divided, though scarcely so in the adults. A pair of horns is present on the front, even in the first instar, in *Oregma* and *Cerataphis*. These are usually larger in the nymphal stages than in the winged adults. In the first instar of *Oregma bambusifoliae* Takah. the apices of the horns are rather pointed; in its later instars they are rounded. *Astegopteryx styracicola* Takah. and *A. styracophila* Karsch are provided with some short setae on the front of head. These are seen also in the wingless, but not in the winged adults. The frontal or antennal tubercles are absent in the young nymphs of the genera *Macrosiphum* and *Amphorophora*, appearing, however, with the first or second moult, gradually developing with the later moults and becoming distinct in the full-grown nymphs. In *Phorodon*, as well as in *Akkaia polygoni* Takah. they are distinct, being themselves provided throughout all the nymphal instars with a secondary tubercle smaller than that of the adult on the inner side. In the genus *Myzus* they are very short with the inner side distinctly gibbous, even in the first instar.

The eyes are smaller and usually less outstanding in the younger instars than in the adult stage, though in *Eulachnus* they are very distinctly protuberant even before the first moult. In the genera *Oregma*, *Cerataphis*, *Aleurodaphis*, *Astegopteryx*, *Neophyllaphis*, *Cervaphis*, etc., they are very small, being composed of only three facets, excepting in the full-grown nymphs of the winged form, in which they are of numerous facets as in the winged adults. In many species the ocular tubercles are not visible in the first instar, though three facets on the hind portion of the eye are larger than the remaining ones; but in *Rhopalosiphum nymphaeae* L., as well as in *Shivaphis celti* Das, they may be recognized even in the first instar. These ocular tubercles gradually become more distinct with growth. The facets on the ocular tubercles are always three in number; and in none of these insects have eyes been found which are composed of less than three facets. In my opinion, the three facets, of which the degenerated eyes of the apterous forms and most nymphs of *Oregma*, *Cerataphis*, *Astegopteryx*, *Cervaphis*, *Neophyllaphis*, etc., are composed, correspond to the facets on the ocular tubercles of other aphids. The ocelli are always absent during the nymphal life.

The rostrum is longer in proportion to the length of body

in the young instars than in the grown ones or adults, sometimes, as in the first instar of *Pterochlorus*, reaching beyond the end of the abdomen.

The sexes of *Pemphigus*, etc., as well as the males of *Stomaphis*, possess a rudimentary rostrum in the nymphal life and take no food, in this respect differing from the adults.

The antennae are shorter, stouter and less inbricated than in the adults. In the winged forms of some *Astegopteryx*, they are rather slender, inbricated and actively movable in the first instar. Later, however, they become quite stout, are not inbricated and hardly movable, being laid around the side of the head. The antennae are sometimes as many jointed as in the adults throughout all the nymphal instars, but usually are less jointed in the young nymphs than in the grown ones or adults. In the first instar they are usually 4 or 5, rarely 3, but never 6-jointed. According to Davis, the first instar of the first generation of *Macrosiphum pisi* Kalt. has the antennae less jointed than in the corresponding instar of other generations. In the full-grown nymphs they are usually as many jointed as in the adults. The mode of joint-multiplication is the same in all species. The new joints are abjected from the third joint, not from others, and only one joint, not more, may be increased with any one moult from the first to fourth, as shown in the accompanying table. Each joint of each instar is usually longer than the corresponding joint of the preceding instar, but the third joint of the second or third instar is sometimes shorter than that of the preceding. The two basal joints are always very short and stout, as in the adults; they correspond to the scape and the remaining part to the flagellum in other insects. The first joint, in the genus *Neophorodon*, is furnished with a tubercle on the inner side, smaller than those of the adults. The third joint is destitute of hairs in the first instar, but is provided with them in the later instars in the genus *Macrosiphum*. The secondary sensoria are almost always wanting during the nymphal stage, but the grown nymphs of some *Dilachnus*, *Lachnys* and *Eulachnus* are furnished with a few secondary ones on the fourth or fifth joint. Each of the two last joints is always provided with a primary sensorium which is sometimes surrounded with a row of hairs as in the adults. The last joint also has some smaller sensoria in a group besides the primary one, even in the first instar. The filament or spur is as in the adults.

The thorax is very simple in structure, as no sclerites are distinguished even in the mesonotum of the full-grown nymphs of the winged form. In *Oregma*, *Cerataphis*, *Astegopteryx*, *Aleurodaphis*, *Neophyllaphis*, *Cervaphis*, *Greenidea*, etc., as mentioned already, the pronotum and the head are usually defined in the fourth instar and adults of the winged form; but

are completely fused together in other instars of the winged form as well as in all the stages of the wingless. The pronotum is furnished with a small lateral tubercle even in the first instar in the genera *Aphis* and *Rhopalosiphum*. The mesothorax of the winged form begins to develop, protruding on the side, in the third instar, and becomes larger, with the wing-pads well developed, in the fourth.

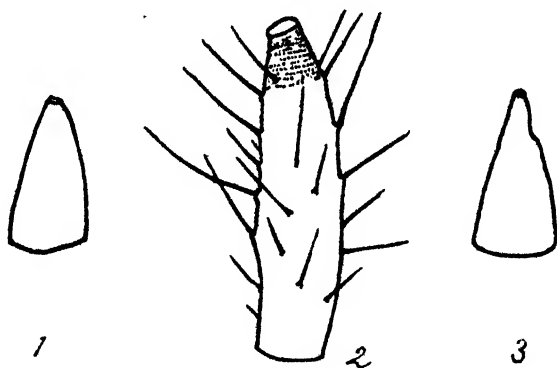
The wing-pads are usually dusky or pale greenish in colour, always lacking hairs and wax-pores, and are laid close to the side of the thorax, especially so in Callipterina. The hind pair of them is always smaller, being completely covered with the front pair in the fourth instar.

The legs are shorter and stouter than in the adults, with the tarsi 2-jointed and furnished with two claws. The first tarsal joint is smaller than the second as in the adults. In some Callipterina limpid empodial hairs are present even in the young nymphs, as in the grown ones or adults. Some Hormaphidina are furnished with a few very long capitate hairs on the tarsi which are sometimes imbricated even before the first moulting. In young nymphs of the genus *Periphyllus* the hind tibia is provided with some bristles arranged almost in a single row; these are much more abundant in the grown nymphs, but are not arranged in a row; in the dimorphs the front and middle pairs of tibiae have lamellae, but no normal hairs.

The abdomen becomes stouter with the process of growth. The lateral tubercles are recognizable even in the first instar in *Rhopalosiphum* and *Aphis*, while the dorsal ones which are very prominent in the winged adults are not seen in the nymphal stages of *Myzocallis pseudoalni* Takah. or *Callipterus kahuwaluokalani* Kirk. In *Cervaphis* the abdomen, like the head and thorax, is provided with long projections which are branched in the grown nymphs, but not in the first instar. *Cavariella* is furnished above the cauda with a tubercle much smaller than that of the adult, even in the young nymphs, and in *Greenidea*, each of the seventh and eighth abdominal segments of the first instar is provided with a pair of tubercles which entirely disappear with the first moult. The dorsal tubercles on the seventh and eighth abdominal segments are very distinct in the genus *Akkaia*, being as large as or larger than those of the adults even in the young nymphs. *Setaphis viridis* v. d. Goot is armed with a pair of sharply pointed horns on the abdomen throughout all the nymphal instars.

The cornicles are shorter, stouter and less imbricated than in the adults, being never reticulated, and are especially shorter in the younger nymphs. In *Amphorophora*, they are less dilated in the young nymphs than in the grown ones or adults, and *Rhopalosiphum nympharum* L. possesses somewhat dilated cornicles even before the first moult takes place. In *Akkaia*

polygoni Takah., Lachnina, some Callipterina, Hormaphidina, etc., the cornicles of the immature stages are almost similar in shape to, but usually smaller than, those of the adults; while in *Chromaphis carpinicola* Takah. those of the full-grown nymphs are larger than those of the winged adults. In *Oregma*, *Cerataphis*, *Aleurodaphis*, *Astegopteryx*, etc., the cornicles are not recognizable during the first instar, appearing, however, with the first moult. In the first instar of some aphids they are very remarkable in structure. In *Dilachnus*, *Lachnus* and *Pterochlorus*, they are situated on the cones which are almost or entirely destitute of hairs and very short in the first instar, but are hairy and larger in the second and subsequent instars.



- 1.—Cornicle of the first instar of *Greenidea formosana* Maki.
- 2.—Cornicle of the second instar of the same.
- 3.—Cornicle of the first instar of *Greenidea kuwanai* Pergande.

The cornicles of the first instar, in *Greenidea*, are also very peculiar. They are conical in shape, have the opening at the apex very small, are not imbricated, entirely destitute of hairs, and resemble tubercles. With the first moult they become elongate and hairy, with the opening at the apex larger. The cornicles of *Cervaphis quercus* Takah. (like those of *Greenidea*) are without hairs in the first instar, but those of *Trichosiphonaphis* have some capitate ones in this stage.

The cauda is usually (especially so in the younger nymphs) shorter, stouter and less hairy than in the adults and is never constricted at the base or midlength. It is often wider than long; sometimes as long as wide in the grown nymphs of some Aphidina; and longer than wide in the fourth instar of the genus *Macrosiphum*. When seen from above, it is nearly triangular in shape with the apex rounded, and the cephalic margin broadly rounded, the latter sometimes to a semicircle. In *Myzocallis* and some other Callipterina, it is destitute of hairs,

and has the hind margin rounded, throughout all the nymphal instars.

The anal plate is very simple, never bilobed and usually not sinuated; but in *Greenidea* it is somewhat sinuated even in the first instar. In *Akkaia* it is not developed in the nymphs.

The genital opening is not seen in the immature stages.

The spiracles in number and arrangement are as in the adults. They are sometimes slightly protruding.

The hairs on the body, as well as on its appendages, are usually less in number in the young nymphs than in the grown ones or adults. In some *Periphyllus*, the dimorphs are provided with very peculiar hairs called "lamellae." The grown nymphs of the winged form of *Chromaphis carpinicola* Takah. are furnished with many bristles stouter and longer than those of the adults. In some *Myzocallis*, *Myzus*, *Neophorodon*, *Trichosiphonaphis* and *Capitophorus*, the nymphs of both the winged or apterous forms are furnished with a number of capitate hairs like those of the wingless adults. The winged adults have only normal hairs.

The wax-pores are as well developed in some species, even in the first instar of the winged or wingless forms as in the wingless adults. They are present in the winged adults of *Shivaphis celti* Das, but not in those of Hormaphidina. In *Oregma bambusifoliae* Takah. and *O. bambusicola* Takah. the wax-pores of all the instars of either the winged or wingless forms scarcely differ from those of the apterous adults in number, shape and distribution; but they do differ in some other species. In the full-grown nymphs of the winged form of *Oregma panicola* Takah. they are very small, and scattered over the head and thorax, but absent from the abdomen; while in the nymphs of the apterous form of the same species they are larger, circular and distributed as in *Oregma montana* v. d. Goot. In *Astegopteryx* and some of Hormaphidina, the nymphs of the wingless form have many wax-pores arranged in a single row along the whole margin of the body, while throughout all the nymphal instars the winged form has them arranged more in groups upon the dorsum.

SOME DIFFERENCES BETWEEN WINGED AND WINGLESS FORMS.

In the first and second instars, the nymphs of the winged form usually do not differ from the corresponding stages of the wingless, but in the third or fourth they always differ structurally. However, in some species of Hormaphidina, as mentioned already, the nymphs of the winged form, even in the first instar, distinctly differ from those of the apterous in the number and distribution of the wax-pores on the body.

TABLE OF ANTENNAL JOINTS.¹

SPECIES	FORM	NUMBER OF ANTENNAL JOINTS				INVESTIGATOR
		NYMPH			ADULT	
		1st instar	2d	3d		
<i>Macrosiphum formosanum</i> Takah.	V. ♀	5	5	6	6	Takahashi
<i>Macrosiphum gobonis</i> Mats.	Do.	5	5	6	6	Do.
<i>Macrosiphum neoartemisiae</i> Takah.	Do.	5	5	6	6	Do.
<i>Macrosiphum pisi</i> Kalt.	F. ♀	4	?	?	?	Davis
Do.	V. ♀	5	?	6	6	Do.
<i>Macrosiphum illinoensis</i> Shim.	F. ♀	3	4 or 5	5	5	Baker
Do.	V. ♀	?	?	?	?	Do.
Do.	O. ♀	4	4	5	6	Do.
<i>Myzus tropicalis</i> Takah.	V. ♀	4	5	5 or 6	6	Takahashi
<i>Amphorophora indica</i> v. d. Goot	F. ♀	5	5	5	5	Do.
Do.	V. ♀	5	5	6	6	Do.
<i>Amphorophora oleraceae</i> v. d. Goot	Do.	4	5	6	6	Do.
<i>Cavariella neocaprae</i> Takah.	V. ♀	4	5	5	5	Takahashi
<i>Rhopalosiphum nymphatae</i> L.	Do.	4	5	5 or 6	5	Do.
<i>Toxoptera nigra</i> Baker.	O. ♀	4	5	5	5 or 6	Baker
<i>Toxoptera mühlbergiae</i> P. et D.	F. ♀	4	5	5	5 or 6	Phillips and Davis
<i>Aphis malvoides</i> v. d. Goot	V. ♀	4	5	6	6	Takahashi
<i>Aphis sambuci</i> L.	Do.	4	5	5 or 6	6	Do.
<i>Aphis maidis</i> Fitch	Do.	4	4	5	5	Davis
<i>Aphis pomi</i> De Geer.	F. ♀	4	5	5	5	Baker and Turner
Do.	V. ♀	4	5	5	6	Do.
Do.	Sex	4	5	5	6	Do.
<i>Aphis houghtonensis</i> Troop	A. v. ♀	4	4	5	6	Baker
<i>Aphis maidi-radicis</i> Forbes	V. ♀	4?	5	5	6	Davis
<i>Aphis sarbi</i> Kalt.	F. ♀	4	4	5	6	Matheson
Do.	V. ♀	?	?	6	6	Do.
<i>Aphis malifoliae</i> Fitch.	F. ♀	4	5	5 or 6	6	Baker and Turner
Do.	V. ♀	4	5	6	6	Do.
<i>Hyalopteris pruni</i> Fab.	F. ♀	5	5	5	5	Davidson
Do.	V. ♀	5	?	?	?	Do.
<i>Greenidea kuanai</i> Pergande	Do.	5	5 or 6	6	6	Takahashi
<i>Greenidea formosana</i> Maki.	Do.	5	5 or 6	6	6	Do.

This might be taken as an indication that, in some species at least, the production is not determined by external factors operating after the birth of the insect.

In some Hormaphidina, as already stated, the antennae and legs of the nymphs of the aleyrodiform female become more reduced with the process of growth, while those of the nymphs of the winged form develop more in the later instars. In the third instar of the winged form, the mesothorax is developed, the wing-pads beginning to appear, and the third antennal joint is often longer than that of the corresponding stage of the wingless. The third antennal joint of the winged form, in *Oregma bambusifoliae* Takah., etc., is longer than that of the wingless even in the second instar; and in the grown nymphs of some Pemphigina and Hormaphidina, the antennae of the winged form are longer and more jointed than those of the wingless. In the fourth instar of the winged form, the wing-pads are well developed.

The eyes of *Oregma*, *Cerataphis*, *Aleurodaphis*, *Astegopteryx*, *Neophyllaphis*, *Cervaphis*, etc., are composed of three facets in all the instars of the wingless form, as well as in the first three instars of the winged, while they are of numerous facets in the fourth instar of the winged nymphs as they are in the winged adults. In the fourth instar of the winged forms of the genera *Oregma*, *Aleurodaphis*, *Astegopteryx*, *Neophyllaphis*, *Cervaphis*, *Greenidea*, etc., the head and pronotum are usually defined. In other instars of the wing form and all instars of the nymphs of the wingless they are fused together.

In *Oregma panicola* Takah. the grown nymphs of the winged form, as mentioned already, are provided with numerous very small wax-pores scattered over the dorsum of the head and thorax, while those of the wingless have some larger circular ones distributed as in *Oregma montana* v. d. Goot. The nymphs of the brachypterous form usually do not differ from those of the normally winged one.

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A NEW SPECIES OF BRACHYS FROM ARIZONA
(COLEOPTERA: BUPRESTIDAE).

BY W. S. FISHER, *U. S. Bureau of Entomology.*

In rearranging the leaf-mining Buprestidae in the United States National Museum Collection, the following new species was found.

***Brachys barberi*, new species.**

Male.—Broadly ovate, two times as long as wide, broadly rounded in front, and slightly more acuminate posteriorly, moderately shining and sparsely pubescent, the pubescence forming three more or less distinct fasciae on the elytra; head and pronotum piceous, with a strong aeneo-cupreous tinge; elytra piceous, with a strong bluish or purplish tinge, and becoming feebly aeneous at base and along the suture; beneath piceous, with a rather strong aeneous reflection.

Head feebly convex, transversely flattened behind the epistoma, and without distinct gibbosities on the vertex, broadly and rather deeply longitudinally grooved from occiput to near the epistoma, the groove becoming more shallow on the occiput; surface finely and irregularly punctate, the punctures rather densely placed near the epistoma but becoming more obsolete and widely separated posteriorly, rather densely clothed with long recumbent reddish-yellow hairs, and the intervals nearly smooth; epistoma rather wide between the antennal cavities, flat, and not transversely carinate in front. Pronotum moderately convex, two and one-half times as wide as long at middle, distinctly narrower in front than behind, and widest at the base; sides feebly sinuate and obliquely attenuate from base to anterior angles (when viewed laterally the margin is abruptly arcuate near the posterior angles for the reception of the anterior legs); anterior margin transversely truncate; base transversely truncate to middle of each elytron, where it is distinctly arcuately emarginate, then turning obliquely backward to the scutellum, in front of which it is feebly arcuately emarginate; posterior angles nearly rectangular; surface broadly depressed at the sides, the depression extending obliquely from the anterior angles to the base at middle of elytron, then transversely along base, causing the antero-median part of the disk to be regularly convex, there is also a small oblong gibbosity on each side in the depressed area near the posterior angles, the surface with feebly impressed ocellate punctures, sparsely placed on the disk, but becoming denser in the depressed areas, sparsely clothed with long recumbent reddish-yellow hairs, and the intervals obsoletely granulose. Scutellum triangular, with the anterior margin feebly arcuately rounded and the surface obsoletely granulose. Elytra as wide as pronotum at base; humeral angles obtusely angulated; sides nearly parallel to middle (strongly sinuate at basal fourth), then arcuately attenuate to the tips, which are conjointly broadly rounded, with the lateral margin entire; humeri prominent. Each elytron with a broad, deep depression at the base, and a narrow one between the humerus and lateral margin, and with a distinct lateral carina, which is sinuate and strongly elevated, extending from the humeral angle to near the apex, there is also a more or less distinct carina between the lateral carina and the suture,

situated closer to the former, but not extending to the base nor apex, with three or four fine lines of fulvous hairs extending from base to near apex, and with three more or less distinct fasciae arranged as follows: An irregular, rather obsolete one composed of short cinereous hairs, extending from the scutellum obliquely backward to the lateral margin behind the humerus; a narrow zigzag one near the middle, very irregular in shape, and bent backward along the suture; and a broad one covering the apical fifth, composed of cinereous hairs bordered posteriorly with fulvous hairs and enclosing a round glabrous spot; the surface finely and irregularly punctate, the punctures becoming more distinct toward the base, and the intervals smooth and shining. Abdomen beneath sparsely ocellate-punctate, the punctures large, shallow, open posteriorly, and from the center of each puncture arises a short recumbent cinereous or fulvous hair; intervals finely granulose; last segment broadly rounded at apex, with the margin entire, and the apical groove following the outline of the posterior margin.

Female.—Differs from the male in having the head more transversely flattened behind the epistoma, not quite as densely punctured, more sparsely pubescent, and the median groove more deeply impressed; last abdominal segment broadly rounded at apex, the margin armed with a series of regularly placed narrow, parallel teeth, the apical groove subtruncate, strongly sinuate, and the area in front of the apical groove broadly arcuately emarginate, without a series of long hairs.

Length, 4.7 mm.; width, 2.4 mm.

Type locality.—Williams, Arizona.

Other localities.—Las Vegas Hot Springs, New Mexico.

Type, allotype and paratypes.—Cat. No. 26778, U. S. N. M.

Described from a series of seven specimens, two males and five females, six of which were collected at the type locality during May, June and July, by Messrs. Barber and Schwarz, and the other specimen taken at Las Vegas Hot Springs, New Mexico, August 3, by the same collectors.

The species is closely allied to *Brachys ovatus* Weber, with which it may be confused in collections, but it can be separated from that species by the head and pronotum being more aeneo-cupreous, and the pubescence on the elytra more abundant. In rubbed specimens the males may be difficult to separate, but the females can be easily separated on the structure of the last abdominal segment. In *ovatus* the apex is subtruncate and the apical half of the segment deeply concave, with a row of long densely placed pale yellow hairs along the edge of the concavity, while in *barberi* the last abdominal segment is broadly rounded at apex, with a strongly sinuate apical groove, and the area in front of the groove broadly arcuately emarginate, and without the row of densely placed long hairs.

THE IDENTITY OF *CONOHALICTOIDES NOVAEANGLIAE*
ROBERTSON.

BY H. L. VIERECK.

The regularity with which *Conohalictoides novaeangliae* Robertson visits solely *Pontederia cordata* in the Eastern United States led me to believe that the *Halictoides novaeangliae* recorded by Dr. Craenicher, Can. Ent., 42 (104), 1910 might prove to be another species since Dr. Craenicher's specimens were caught invariably visiting flowers of *Monarda fistulosa* and *Agastache foeniculum*. Accordingly I wrote to Mr. T. E. B. Pope, Curator, Public Museum, Milwaukee, Wisconsin, for the loan of Dr. Craenicher's material. This request being granted, I, thanks to the courtesy of Mr. Pope, Dr. Skinner, Mr. Rohwer and Mr. Haimbach, assembled twenty-nine specimens in addition to four of my own. Of these thirty-three specimens fifteen are females and eighteen are males. I could detect no tangible difference between the females although among the males I found two types according to the structure of the sixth, seventh and eighth sternites and the genitalia. For the bee that visits *Monarda fistulosa* and *Agastache foeniculum* I propose the name *Conohalictoides monardae* new species although I can not separate the females of this species from the females of *C. novaeangliae* Robertson visiting *Pontederia cordata*. The accompanying figures graphically show the difference in the male genitalia of these species and in the sixth and eighth sternites.

The localities for the females are as follows: Chestertown, Maryland, August 12, 1901, one specimen [A. N. S. P.]; Castle Valley, Bucks Co., Pennsylvania, July 16, 1922, ten specimens [F. Haimbach]; Maiden Rock, Pierce Co., Wisconsin, August 4-10, 1910, No. 39037, one specimen; Genoa, Wisconsin, (Vernon Co.), July 7-12, 1911, No. 50770, one specimen; N. Hudson, St. Croix Co., Wisconsin, August 13, 14, 1909, No. 30400, one specimen [Public Museum, Milwaukee, Wisconsin]; Maiden Rock, Pierre Co., Wisconsin, August 4, 10, 1910, No. 39036, one specimen [U. S. N. M.].

The data for the males is as follows: *C. monardae* Viereck, type, figured, Wausau, Wisconsin, August 7, 1910, No. 47335; Randall, Burnett Co., Wisconsin, August 5-7, 1909, No. 29762, one specimen; Namekagan River, Burnett Co., Wisconsin, July 25, 26, 1909, Nos. 29025, 29028, two specimens, one of these with oblique carinae on the sixth sternite like in *novaeangliae* but with hind trochanters stubbily produced as in typical *monardae* not conically produced as in *novaeangliae* [P. M. M. W.]; Namekagan River, Burnett Co., Wisconsin, July 25, 26, 1909, Nos. 29026, 29027, two specimens. [U. S. N. M.] *C. novaeangliae* Robertson, specimen figured, Analostan Island, Little River, Washington, D. C., July 15, 1916, on flowers of *Pontederia cordata*, two

specimens; Tullytown, Bucks Co., Pennsylvania, July 9, 1922, on flowers of *Pontederia cordata*, two specimens [Collection H. L. Viereck]; Castle Valley, Bucks Co., Pennsylvania, July 16, 1922, seven specimens [F. Haimbach]; Hampton, New Hampshire, July 17, 1910, No. 76, S. A. Shaw, [U. S. N. M.].

Comparison of these species with *Halictoides dentiventris* Nylander, determined by Friese, the genotype of *Halictoides*, reveals at least a subgeneric difference in the shape of the head, etc. *H. dentiventris* Nyl. has simple hind coxae in the male, a radically different set of genitalia and a simple sixth sternite than in *Conohalictoides*.

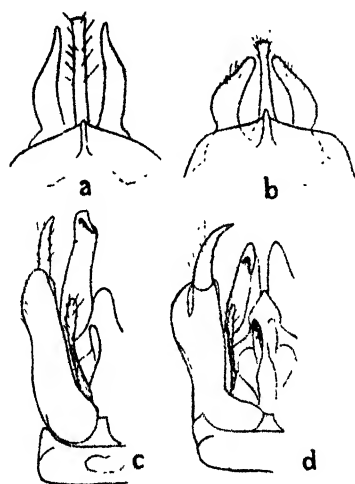


Fig. 1. Details of *Conohalictoides*: a=sixth, seventh and eighth sternites of *C. novaeangliae*; b=sixth, seventh and eighth sternites of *C. monardae*; c=hypopygium of *C. novaeangliae*; d=hypopygium of *C. monardae*.

NOTES ON SOME GENERA OF DERBIDAE (HEMIP.).

By F. MUIR, *Hawaiian Sugar Planters' Experiment Station, Honolulu, H. T.*

During a visit to Stockholm last summer I had the pleasure of examining a number of Stal's historic types of Homoptera in the Naturhistoriska Riksmuseets. This has enabled me to correct some wrong ideas which I held respecting certain genera. I take this opportunity to thank Dr. Yngve Sjostedt for placing the conveniences of the museum at my disposal during my stay, and Dr. A. Roman for the trouble he went to on my behalf and the time he placed at my disposal.

LAMENIA Stal.

Lamenia Stal, Eugenie Resa Ins. p. 277 (1859); haplotype.—*caliginea* Stal.

The type material of this species consists of one female from Tahiti which appears to be the same species that I have from Samoa. The tegmen is fairly narrow and the costal and hind margins subparallel, the Sc cell is short, Sc and R being joined together to well beyond the middle of tegmen. There is no distinct shoulder keel but there is a distinct subantennal process joined to the gena by a wide base. The vertex is a little longer than wide, the frons comparatively narrow and without a median longitudinal carina; the lateral carinae are fairly large; the clypeus is tricarinate.

Thyrocephalus Kirkaldy is the same as *Lamenia*. The genus *Vekunta* Dist. comes close to *Lamenia* but there is no distinct subantennal process. A few species which I have placed in *Vekunta* have an obscure carina or ridge but it can not be mistaken for a subantennal process as found in *Lamenia*.

HERPIS Stal.

Herpis Stal, K. Sven. Vet Akad. 3. (6) p. 8 (1860).

This genus was erected for five species from Rio Janeiro of which *fusco-vittata* Stal is the type. In 1866 in a footnote in Hemiptera Africana VI, p. 193, Stal sank this genus into *Lamenia* but they can not be considered as the same. The type material of the type species consists of one female specimen with one tegmen missing; the Sc cell is long, Sc and R forking about one-third from base; Mf about middle of tegmen with six apical veins, M 1, 2, 3, 3a, 3b, 4; claval veins forking near apex of clavus and joining the claval suture; Cu 1 and Cu 1a joining before margin. No subantennal process; shoulder keels well developed; frons fairly broad, subparallel sided, with a faint carina down middle; vertex about as broad as long.

The genus *Syntames* Fowler I consider to be the same as *Herpis*. It has five apical Ms 1, 1a, 2, 3, 4, and Cu 1 does not join Cu 1a but these characters are probably not generic. For the present I shall consider them as synonyms. *Phaciocephalus* Kirk is close to *Herpis* but it has no median frontal carina. *Herpis orba* Stal, *Herpis pallidovenosa* Stal and *Herpis fimbriolata* Stal I would place in *Phaciocephalus* Kirk if the two genera are to be kept apart. *Herpis lugubrina* belongs to *Cedusa* Fowler.

CEDUSA Fowler.

Cedusa Fowler, Bio. Cent. Amer. Hom. I, p. 112 (1904); type.—*funesta* Fowler.

Fowler placed this genus in the Achilidae but it belongs to the Derbidae. It differs from *Herpis* and its allies in having a

distinct subantennal process and also shoulder keels which are sometimes small but distinct. There is no medio-frontal carina or only a very obscure one. The Sc cell is long, the Sc and R forking considerably before the middle of tegmen. M forking about level with node, with six apical veins, M 1, 1a, 1b, 2, 3, 4. The vertex is much broader than long. The shape of the tegmina distinguishes it from *Neocyclokara* Muir. *Poeciloptera vulgaris* Fitch and some other North American species hitherto generally listed under *Lamenia* belong to this genus.

The genus *Cenchrea* Westwood has a short subcostal cell, shoulder keels well developed and no subantennal process.

PHENICE Westwood.

Phenice Westwood, Ann. Mag. Nat. Hist. VI, p. 478 (1841); Trans. Linn. Soc. Lond. XIX, p. 10 (1842). Muir, Ent. Mo. Mag. (3) IV, 1918, pp. 207, 235.

When discussing this genus in 1918 I had not seen the type and provisionally accepted the named specimens in the British Museum as being correct. The genus was erected for *Derbe fritillaris* Boh., *Derbe fasciolata* Boh., and *Derbe stellulata* Boh., and as the generic description was based upon *D. fasciolata* and that species was figured it must be the type.

The type material of *Derbe fasciolata* consists of one male specimen collected by Afzel in Sierra Leone. It has no subantennal processes and no shoulder carina. The clavus is narrowly open and the claval vein touches Cu 1a, apart from the claval suture. Cu has two branches, Cu 1 and Cu 1a, both of which reach the hind margin. M has seven branches which are pectinate, the first or basal sector is bifurcate near its base and represents M 3-4, the others are simple. R and Sc fork near the base, the Sc cell being long and narrow; the R cell is also long and narrow. Hind wing two thirds the length of tegmen, anal area developed. In profile the vertex and frons round; the antennae are nearly as long as face, cylindrical or slightly flattened.

The type material of *Derbe stellulata* Bohm. consists of one female collected by Afzel in Sierra Leone and it is typical of the genus *Phenice*. *Derbe fritillaris* belongs to the genus *Proutisa* Kirkaldy to which *Phenice moesta* Westw. also belongs. Unfortunately the latter was considered typical of the genus for a long time and led to some confusion. Kirkaldy never recognized that *Phenice* belonged to the Derbinae and *Proutista* to the Zoraidinae. The genus *Phenice* comes near to *Dawnaria* Dist., but it is easily recognized from it by the pectinate form of the Ms and the longer antennae. *Phenice furcata-vittata* Stal from Java is a *Proutista*.

PARAPHENICE, new genus.

The examination of the type material of *Phenice fasciolata* (Bohm.) shows that the species which I formerly placed under *Phenice*¹ belong to a genus which at present has no name and for which I propose the name *Paraphenice* type *Phenice neavei* Muir.²

Vertex much longer than width at base, base wider than apex, lateral carinae not meeting together at apex. Frons much longer than wide (about 4 to 1), lateral carinae not touching. Length of antennae less than half the length of face, length of second segment about twice the width, arista at apex. Sub-antennal process well developed; shoulder keels very small. Mesonotum tricarinate. Sc+R forking near base, Sc cell long and narrow, R cell long and narrow; M pectinate with five sectors, the first or basal sector furcate near its base and in intimate connection with, and appearing as pertaining to, the cubitus. Cu with two branches, Cu 1 and Cu 1a, the latter joining the extended suture and not reaching the hind margin; clavus narrowly open; claval fork near middle. Wings about two-thirds the length of tegmina; anal area well developed with anal veins.

This genus is easily separated from *Phenice* by the presence of the subantennal process and by the smaller antennae.

FLACCIA Stal.

This genus is the same as *Lyricea* Kirkaldy and *F. conspersa* Stal=*L. imthurni* Kirk.

PEGGIA Kirkaldy.

The type of this genus is *Nebrissa nitida* Stal and the type material consists of one female specimen which enables me to state the following synonymy:

Nebrissa Stal, Ofv. Vet. Akad. Forh 27, 751 (1870) name preoccupied.

Peggia Kirkaldy, Entomologist (1901) 34, 6, new name.

Mindana Muir, Philip. Journ. Sci. D. 12 (1917) 94, name preoccupied.

Leurometopon Muir, op. c. 20, 3 (1922) 349, new name.

Nebrissa nitida Stal=*Mindana latifrons* Muir.

Peggia irrorata Muir (Philip. Journ. Sci. D. 12 (1917), 87), can be placed in *Zoraida* subgenus *Peggiopsis* until the genus is revised.

Zoraida westwoodi (Stal) is represented in the Museum by one male, the type, and it is not the same as the species identified by me as such (Philip. Journ. Sci. XII, D. 2, p. 82 (1917)). The species therein described and wrongly named *westwoodi* (Stal) I now name ***Zoraida falsa*** Muir.

¹Ent. Mo. Mag. 1918, p. 235.

RAIZODA, new genus.

Deribia signoreti Coquerel is represented in the Museum by several specimens which may be part of the type material. I consider it as the type of a new genus.

In the tegmen the first or basal median sector is furcate, the Cu is free from the first median sector, Cu 1 enters the hind margin direct and Cu 1a joins the claval vein and enters the hind margin. Sc and R fork slightly before the middle of tegmen; Sc cell fairly large; R cell fairly large, slightly broadened on apical third; M with four sectors. Wings about half the length of tegmen. Antennae small, with arista at apex. Clypeus longer than face. Head in profile round. Female genital styles abortive.

This genus approaches *Zoraida* and allies in having the first or basal median sector furcate but it is not so intimately connected to the cubital system. It differs from these genera in having small antennae. The *Proutista* group either have none of their median sectors furcate or they have the third (counting from the base upward). The genus *Deribia* belongs to the Otiocerine (Derbinae).

**EVIDENCE THAT THE MEXICAN BEAN BEETLE WAS PRESENT
IN THE UNITED STATES AS EARLY AS 1850.**

BY F. H. CHITTENDEN.

In 1920 the writer made the statement¹ that the "bean ladybird" was, as is well known, described originally in 1850 from Mexico and that injuries were first noticed at about that time. This statement was based on a letter from Judge J. F. Wielandy, dated July 23, 1889, that *Epilachna corrupta* Muls. had been known by its injuries at Watrous, N. Mex., 40 years earlier than the date of writing, which would be about 1849. This will make a period of at least 74 or approximately 75 years that the species has been known to occur in New Mexico. The object of this note is to call attention to the fact that this matter has been overlooked by most writers who have published in regard to this species since 1920. Where an error has once been perpetrated, it is apt to be repeated indefinitely until corrected.

¹Bull. 843, U. S. Dept. Agric., p. 10.

A NEW SUBGENUS OF *NASUTITERMES* BANKS (ISOP.).BY THOS. E. SNYDER, *U. S. Bureau of Entomology.*

There has been considerable discussion among workers on termites in regard to the status of some of the subgenera established by the distinguished Swedish entomologist, Nils Holmgren. In some cases authors have considered subgenera worthy of generic rank. In others there is doubt as to the validity of the subgenera.

The subgenera under *Kaloterme*s Hagen and the subgenera under *Nasutiterme*s Banks (*Eutermes* Fritz Müller) are especially interesting. In *Kaloterme*s the subgenus *Neotermes* Holmgren is of doubtful validity. Material in collections in the United States leads me to believe it would be advisable not to separate species under *Neotermes* from *Kaloterme*s.

In the case of *Nasutiterme*s there are new species in collections in the United States which are intermediate in position between some of Holmgren's subgenera; for example, between *Diversiterme*s and *Velociterme*s. On the whole, however, Holmgren's classical work shows breadth of vision based on a survey of collections from all over the world and I believe the subgenera should be considered valid until more material is at hand.

The new subgenus herewith described differs from any known to the writer. The type species is from Panama.

The termite fauna of the Canal Zone and adjacent areas of the Republic of Panama, while not consisting of a large number of species (only 26 are known), contains some very interesting forms in the 15 genera or subgenera occurring in this region.

Genus *NASUTITERMES* Banks.*OBTUSITERMES*, new subgenus

Soldier.—Two types of soldiers; head slightly (in large soldier) or greatly (in small soldier) constricted behind antennae. Mandibles without points. Nasus conical, fairly elongate and thick.

Outlines of head of soldiers somewhat similar to the large and intermediate soldiers of species in the subgenus *Diversiterme*s Holmgren. Antennae with 11 segments. Legs relatively short—length of hind tibia much less than length of entire head.

Post-clypeus of *worker* nearly as long as half its width.

Small, light colored species.

Genotype.—*Nasutiterme*s (*Obtusiterme*s) *biforma* Snyder from Quipo, Republic of Panama.

*Nasutiterme*s (*Obtusiterme*s) *biforma*, new species.

Large soldier.—(Plate 1, figs. 1, 2). Head light yellow-brown, pale posteriorly but light castaneous-brown anteriorly, nasus light castaneous-brown with

reddish tinge; broader posteriorly than anteriorly, gradually narrowing (converging) towards anterior margin, slightly constricted behind antennae, convex in profile, with slight depression about center of head, with short hairs but few long hairs (two transverse rows, one anteriorly, the other posteriorly), and numerous short hairs; nasus conical, somewhat thick, slightly upturned at apex, with short and few long hairs near apex. Mandibles without points.

Antennae light yellow-brown, with 11 segments, pubescent; third segment subclavate, slender, longer than second or fourth segments; fourth segment shorter than second; segments becoming broader and longer from fourth segment to apex; last segment elongate, narrow and sub-elliptical.

Pronotum yellow, yellow-brown at anterior margin where slightly emarginate, saddle-shaped; posterior margin nearly a straight line; with short hairs.

Legs white with tinge of yellow, relatively not very long, slender, pubescent.

Abdomen yellow, with row of long hairs at base of each tergite, also short hairs on tergites.

Measurements:

- Length of entire soldier: 2.50-2.85 mm.
- Length of head with nasus: 1.0-1.1 mm.
- Length of head without nasus (to anterior): 0.67 mm.
- Length of nasus: 0.35-0.37 mm.
- Length of pronotum: 0.11 mm.
- Length of hind tibia: 0.57-0.60 mm.
- Width of head (at posterior where broadest): 0.60-0.62 mm.
- Width of head (at anterior): 0.42 mm.
- Width of pronotum: 0.36-0.37 mm.

Small soldier. (Plate 1, figs. 3, 4). Head of slightly lighter color than large soldier, nasus appears relatively darker, hairs the same; head broader anteriorly than posteriorly, markedly constricted in middle, in profile showing marked depression at center of head posterior to elevation at base of nasus; nasus conical, slender and slightly pubescent, upturned at apex as in large soldier, mandibles without points.

Antennae light yellow brown, 11 segments, pubescent; third segment subclavate, slender, longer than second or fourth segments; fourth segment shorter than second; segments from fourth to apex becoming broader and longer; last segment elongate, narrow and sub-elliptical.

Measurements:

- Length of entire soldier: 2.35-2.70 mm.
- Length of head with nasus: 0.90-0.93 mm.
- Length of head without nasus (to anterior): 0.57 mm.
- Length of nasus: 0.32 mm.
- Length of pronotum: 0.10 mm.
- Length of hind tibia: 0.52-0.55 mm.
- Width of head (at anterior where broadest): 0.42 mm.
- Width of head (at posterior): 0.37 mm.
- Width of pronotum: 0.36 mm.

Type locality.—Quipo, Republic of Panama.

Described from a series of two types of soldiers collected with workers at the type locality, May 18, 1923, by Messrs. I. Molino and J. Zetek. The termites completely riddled a small dead branch among leaf mold. Quite a few specimens of both the large and small soldiers of *Obtusitermes biforma* Snyder were also found with other termites, ants, etc., in the stomach of a Chiriqui three-toed anteater (*Tamanduas tetradactyla chiriquensis* Allen) killed by R. C. Shannon on Barro Colorado Island (Erwin's Island), Gatun Lake, C. Z., Panama, on June 17, 1923.

Type, soldier.—Cat. No. 26369, U. S. N. M.

***Obtusitermes aequalis*, new species.**

Large soldier.—Head yellow-brown, paler posteriorly and at base; nasus castaneous-brown, broader posteriorly than anteriorly, narrows (converging, towards anterior margin, slightly constricted behind antennae, nearly straight but slightly convex in profile and with slight depression at about center of head; with fairly long hairs but also with numerous longer hairs; nasus *conical*, somewhat thick at base and slightly upturned at apex, with short and few long hairs near apex. Mandibles blunt, without points.

Antennae light yellow-brown with 11-12 segments pubescent; second, third and fourth segment subequal; segments become longer and broader toward apex; last segment slender, elongate, subelliptical.

Pronotum yellow-brown, darker at anterior margin, where slightly emarginate, saddle-shaped, elongate, not sharply upraised; anterior margin with long hairs; posterior margin nearly at straight line.

Legs yellowish, relatively not very long, slender, pubescent.

Abdomen yellow-brown, with dense fairly long hairs and rows of longer hairs at base of each tergite.

Measurements:

Length of entire soldier: 2.80-2.90 mm.

Length of head with nasus: 0.97-1.0 mm.

Length of head without nasus (to anterior): 0.60 mm.

Length of nasus: 0.37 mm.

Length of pronotum: 0.15-0.16 mm.

Length of hind tibia: 0.60 mm.

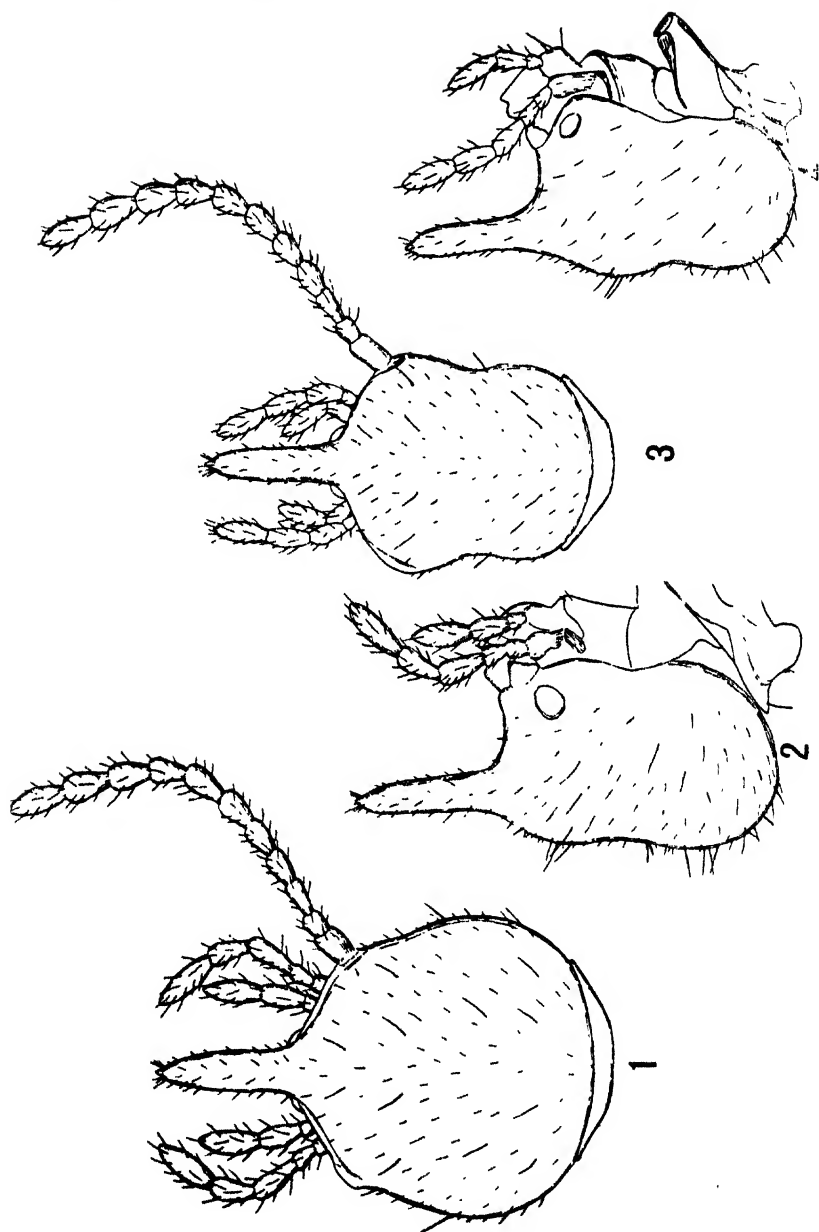
Width of head (at posterior where broadest): 0.60 mm.

Width of head (at anterior): 0.45 mm.

Width of pronotum: 0.30 mm.

Worker: Head yellow-brown, with prominent white longitudinal line, meeting epicranial suture at frontal gland; antennae with 13-14 segments; length of post-clypeus nearly one-half its width.

This species is referred to the subgenus *Obtusitermes* which contains species with two types of soldiers. In connection with *aequalis*, however, only one (the large type) was found. *Aequalis* is darker colored than *biforma* Snyder and differs in size.



Type locality.—Camagüey, Cuba.

Described from seven soldiers (large type) found with workers at The Colony "Elia" at the type locality, July 11, 1923, in a stalk (stump) of sugar cane by Prof. B. T. Barreto of the Estacion Experimental Agronomica, Santiago de las Vegas, Cuba; No. 9016.

Type soldier.—Cat. No. 26489, U. S. N. M.

EXPLANATION OF PLATE I.

- Fig. 1. *Obtusitermes biforma* Snyder. Large soldier. Dorsal view of head.
 Fig. 2. *Obtusitermes biforma* Snyder. Large soldier. Lateral view of head and pronotum.
 Fig. 3. *Obtusitermes biforma* Snyder. Small soldier. Dorsal view of head.
 Fig. 4. *Obtusitermes biforma* Snyder. Small soldier. Lateral view of head and pronotum.
 Drawings by Miss E. T. Armstrong.

NOTE ON MATING FLIGHT OF *HEXAGENIA BILINEATA* SAY¹ (PLECTOPTERA).

By T. F. SNYDER, U. S. Bureau of Entomology.

On June 15, 1923, the mayfly (*Hexagenia bilineata* Say.) became abundant along the shores of the Potomac River between Georgetown and Chain Bridge, D. C. During the day they settled in large numbers on branches of trees along the river banks, but every evening shortly after dusk swarms of these winged mayflies engaged in an interesting mating flight. They left the branches of the trees and hovered over the water nearby in such large numbers as to make quite a rustling noise as they flew. This mating flight lasted about half an hour, until nearly dark. The first few nights that the flight was observed, two adults were very seldom seen flying off together; but on June 20th such pairing was much more frequent. Invariably the pairs flew off over the water, with sometimes a third adult attempting to join the pair.

Birds such as grackles, catbirds, etc., fed on these insects in great numbers during the day time.

Each evening the mating flight began with a few individuals, reached its height with maximum numbers of adults, and then gradually subsided with a decreasing number. These flights could be observed all along the river front in the vicinity of bushes or the lower branches of trees from whence they had come, and they extended throughout a period of about one week.

A similar mating flight has been noted by the writer in connection with *Tabanus americanus* Forster.

¹Determination by Nathan Banks.

PROCEEDINGS OF THE ENTOMOLOGICAL SOCIETY OF WASHINGTON

VOL. 26

FEbruary 1924

No. 2

ADDRESS OF THE RETIRING PRESIDENT.

By L. O. HOWARD.

ON ENTOMOLOGICAL SOCIETIES.

The Entomological Society of Washington will be forty-one years old next month. It is the sixteenth oldest entomological society in the world of those which have been publishing continuously since their formation. Our Society has published no annals or transactions like those that dignify the records of the still active entomological societies of France and of London, but it has published a series of Proceedings which have given it a high rank in the history of biological organizations. As originally produced, these publications were really proceedings of the meetings, but of later years their character has been somewhat altered, and our publications, which are now important for the reference shelves of libraries and are there to be found around the world, are not searched with the keen interest of former years for the notes and experiences of field workers.

During these years, however, the Society has grown. Whether it has broadened or not is another question. Of course, it has broadened as entomology has broadened, chiefly perhaps through the insistent urge of the needs of economic entomology. But the Society no longer attracts to its meetings men of other specialties—general zoologists, geologists, botanists—as it did in other years. It is less a meeting place of naturalists centralizing on entomology, with a distinct social aspect, than a working body of entomologists each distinctly absorbed by some one or more phases of the general subject.

It offers a rather striking contrast to the other entomological societies both in this country and in others. I have listed thirty publishing entomological societies of continuous existence in the order of their founding:

	<i>Approximate present number of members.</i>
1832. Société entomologique de France	600
1833. Entomological Society of London	700
1839. Breslau, Verein für schlesische Insektenkunde	80
1845. Nederlandsche entomologische Vereenigen	170
1855. Société entomologique de Belgique	225

1856.	Entomologischer Verein	500
1858.	Schweizerische entomologische Gesellschaft	110
1859.	Entomological Society of Philadelphia (title changed to American Entomological Society)	300
1859.	Societas entomologica rossica	
1863.	Entomological Society of Ontario	175
1869.	Societa entomologica Italiana	73
1872.	Brooklyn Entomological Society	
1874.	Cambridge Entomological Club	81
1879.	Entomologiska Forening i Stockholm	300
1880.	Deutsche entomologische Gesellschaft	
1884.	Entomological Society of Washington	206
1887.	Entomologisk Forening, Copenhagen	182
1889.	American Association of Economic Entomologists	730
1892.	New York Entomological Society	
1901.	British Columbia Entomological Society	45
1904.	Československé společnosti entomologické (Societas entomologicae Bohemicae)	142
1905.	Allgemeine entomologische Gesellschaft	
1905.	Hawaiian Entomological Society	25
1907.	Société entomologique d'Egypte	143
1908.	Entomological Society of America	645
1913.	Deutsche Gesellschaft für angewandte Entomologie	
1914.	Societas entomologica Helsingforsensis	
1915.	Nova Scotia Entomological Society (Acadian)	32
1916.	Florida Entomological Society	(orig.) 40
1918.	Sociedad entomologica de España	141

One gets a fairly good idea of these societies from their publications. From printed matter, however, one can not gain really desirable information regarding the atmosphere of the meetings, and none at all of the personalities of the men who attend them. The Entomological Society of London still prints a full and fair report of the proceedings of the meetings, and therefore, for this reason as well as for the reason that we too use the English language, we feel better acquainted with that society perhaps than with many of the others. This particular society is a strong, active organization, and it is a great pleasure to attend one of its meetings. The same may be said of the Entomological Society of France, and I am sure of many others, but I greatly doubt that in any of them there is quite so general an interest on the part of members or quite so large an average attendance as at the meetings of our own Society. It seems to me too that we cover a broader field, and it is certainly true that we have a far larger body of professional entomologists among our members than has any other society. When, however, I have had occasion to attend the meetings of other socie-

ties, either in this country or in Europe, I have been extremely interested in the preponderating part taken in these organizations by amateur entomologists; and returning home I miss this element in our own meetings. In past years the bulk of the very important taxonomic work was done by men and women who might be called amateurs, and they still constitute the largest element in almost every working society except our own.

[Here the speaker described certain meetings of the Entomological Society of London and the Entomological Society of France, which he had had the good fortune to attend; also the present meeting room of the Italian Entomological Society in Genoa and that of the Entomological Society of Russia in St. Petersburg before the great war. He also mentioned briefly the local American societies whose meetings he had had the privilege of attending, notably the Cambridge Entomological Club, the American Entomological Society, the New York Entomological Society, the Brooklyn Entomological Society, the Entomological Society of Louisiana, the Jugatae at Ithaca, the old Albany Entomological Society and the old Harris Club of Boston.]

Of late, critical remarks have been made, not only about the Entomological Society of Washington, but about the other scientific societies of this city. So far as the Entomological Society is concerned, I have just indicated in a way a comparison between it and some of the large foreign societies, and I think that such a comparison is not at all unfavorable to our own society. But I realize that as an individual or an organization grows older, in the natural course of things they are apt to become reactionary and perhaps too self-satisfied. I am sure, however, that the officers of this Society, and the whole membership as well, are anxious to make our meetings more interesting and scientifically of greater importance, and I am also sure that they will welcome heartily any constructive criticism.

So much for the entomological societies. For the solidier portion of my address, I wish to place before you certain things relating to the insect parasites of insects.

INSECT PARASITES OF INSECTS.

Although the idea of the practical use of the insect enemies of injurious insects is old (see Marchal's and Silvestri's historical accounts—1907), their application on a large scale under scientific auspices is distinctly modern. The very simple introduction of the *Novius* or *Vedalia* from Australia into California and its extremely rapid and very perfect success occurred only thirty-three years ago, and, while blazing the way for this kind of international work and while it apparently saved the citrus industry of California from extinction by the white scale, it

aroused by its rapid success a host of false hopes and created a school of enthusiasts in California whose misguided efforts held back the progress of economic entomology in that State for ten years or more, who wasted large sums of money in the effort to repeat the success with the aid of untrained and unscientific men, who derided the opinions of skilled students of parasitic forms, and who threatened at one time seriously to interfere with the well planned and scientific work of this general character which had been begun cooperatively by Massachusetts and the Bureau of Entomology with regard to the parasites of the gipsy moth. Incidentally, they introduced and liberated in California at least one injurious form—a secondary parasite which recently has interfered seriously with the work of *Aphycus lounsburyi*, an effective parasite of the black scale.

Although all these secondary results of the success of *Novius* seem most unfortunate, they have taught the level-headed element among the agriculturists and horticulturists and they have taught the economic entomologist to go slowly in such matters and to study most carefully a large number of factors intimately concerned with the success or non-success of such international work.

I am not going into this subject historically, because I have already done so in several publications (see bibliographical list for one of them—1916), but I am going to try to point out that in work of this character there are very many things to be considered and that, like most of the problems of life, it is extremely complicated.

Among the things to be considered carefully and which will involve much study let us consider first briefly what Fiske has called the "sequence of parasites." With such sedentary and simple-living forms as the Coccidae, a single species of parasite or natural enemy may bring about control, as we have seen in the case of the fluted scale and the *Novius* and also with the mulberry *Diaspis* and the little Aphelinine, *Prospaltella berlesei*, in Italy and elsewhere; but when we come to species with life histories complicated by a distinct metamorphosis and whose natural life environment includes multiple elements and which in two of their stages move more or less rapidly, it seems that they are generally attacked by a number of different parasites, certain of which parasitize the eggs, others the different stages of larval growth and still others the pupae. Such a parasitic environment almost invariably occurs in the regions to which the host is native. When the host has become accidentally established in another country it would seem natural to suppose that it will be necessary to reproduce its whole native parasitic environment to bring about control in its new home, and that it will be only when a certain percentage of the eggs have been destroyed that the larval parasites will be able to reduce the

crop enemy to such numbers that the final pupal parasites will bring the species measurably under control. This is the gist of the sequence theory. But it is not so simple as it appears. The extraordinarily complicated question of hyperparasites comes in; and, although at first glance it would seem that it might be possible to avoid bringing in hyperparasites with the primary parasites or that it might be easy to destroy the hyperparasites or at least to prevent them from escaping, we meet the following unfortunate situation. We will shortly consider the question of specificity of parasites, but we must now anticipate by indicating that almost without exception among the parasitic Hymenoptera the hyperparasites are not specific by any means; they are, on the other hand, very catholic, and primary parasites introduced from one country to another will almost surely be attacked by hyperparasites native to the country of introduction; and this attack may often be more effective than the action of the hyperparasites in the country of origin of the primary parasites.

In his well-thought-out paper entitled "A Criticism of the Sequence Theory of Parasitic Control," Dr. W. R. Thompson (1923) concludes that the sequence theory can not be considered as a valid general theory of parasitic action since it applies simply to a very limited group of special cases, and even here he points out in a way that an interruption from some unforeseen cause of the multiplication of one single parasite in the chain blocks the operation and permits the increase of the host.

Another matter carefully to be considered is the relative rate of multiplication of the introduced parasite or predator as compared with the rate of increase of the insect to be controlled. The parasites are necessarily imported in small numbers, with the intent of overcoming perhaps billions of hosts. Figure, for example, that two thousand parasites are brought into this country to destroy say ten millions of a species of injurious insect and that the parasites multiply twice as fast as the host insect. A mathematical computation will show that, all things going well, it will take the parasites seven or eight years to catch up with the host. In this matter of multiplication we must consider, not only the number of generations annually of each species, but the number of eggs laid by the females of each generation. There are also here other facts besides the number of generations, which come in as possibly favoring rapidity of development of the parasites. The phenomenon of parthenogenesis occurs widely among the parasitic Hymenoptera, and where we have, as often occurs with this group, a whole generation composed entirely of fertile females or very largely of such individuals, the parasite has an enormous advantage, and control may more speedily be reached.

Unfortunately, however, parthenogenesis is not confined to

beneficial parasites. It reaches its highest development in the plant-lice, all of which are prejudicial to human interests. However, the extraordinary powers of multiplication given to the plant-lice by this virgin birth are measurably compensated by the extraordinary numbers of natural enemies, both parasites and predators, which destroy these insects, which are themselves so delicate, so weak, and apparently so appetizing that, with the exception of a few species more or less protected by coloration or by exudations from special glands, it is only by this rapid multiplication that they maintain their existence.

Another factor is that of polyembryony. In parasitic forms in which this extraordinary vital process occurs the parasites have an enormous advantage over their hosts. Unfortunately, so far as our present investigations have gone, polyembryonic parasites are rather rare and are not serious factors in the control of many injurious insects of first-class importance. The recent studies of Leiby and Hill (1923) have demonstrated this mode of development with an important parasite of the Hessian fly; Silvestri (1906-1921) and Patterson (1919) have shown it with certain parasites of crop-destroying Noctuid larvae, while, of course, Marchal (1904-6) originally pointed it out in the case of a parasite of a Hyponomeuta injurious to small fruits in Europe but which as yet has done little or no damage in the United States.

Then comes in the question of necessary secondary hosts. A European parasite, for example, noted for heavy parasitism of a given injurious insect, may have and often has more than one generation annually, while the host insect with which we are principally concerned has but one. In such cases it is necessary that the parasite should have one or more additional hosts with a different cyclical evolution, to carry it through the year. Should this parasite be carried to another country with a differing fauna it might very well fail entirely against the host insect for which it was imported, on account of the absence of other hosts to carry it through the year. Such parasites, of course, are by no means specific, and it often happens that in the country of introduction they accommodate themselves to other hosts native to the new country. We have seen both of these conditions in the course of our work with the parasites of the gipsy moth; and I have indicated in a paper published a year or so ago that, not only have certain of the introduced parasites been able to carry themselves through several generations upon native insects, but they have become noteworthy enemies of some of our native injurious forms. Thus, one of the *Apanteles* imported to destroy the gipsy moth has become an abundant parasite of the white-marked tussock moth; while one of the *Tachinids*, also imported to destroy both the gipsy moth and the brown-tail moth, has taken to a large number of American hosts

and has become an apparently important parasite of more than twenty species of which at least half a dozen are of very considerable economic importance.

The presence of secondary hosts, however, seems to be of importance in another way than the filling in of gaps as has been described, although investigations along this line have not been as yet carefully followed out. I tabulated, in my early paper entitled "A Study in Insect Parasitism," (1897) the periods of issuing of the sexes of *Pimpla inquisitor*, showing the point which interested me for the moment, namely, the prior issuing of the males, but these studies were made with a single host. The European observer, Schevirev, studying a congeneric parasite in Russia, announced in 1913 that he had reared females, and *females only*, from large-sized Lepidopterous larvae, and males, and *males only*, from small Lepidopterous larvae of other species. Some such vital habit as this may at any time be found and will account perhaps for failures in establishment of imported forms.

Still another factor which has already been noted in practice and which at any time may happen in future work is the interbreeding of imported forms with native forms or races of different host relations. We come here against the old questions as to what is a species, and what is a geographical race, and is there such a thing as a physiological species? For example, there is in Europe a well known parasite of the gipsy moth and other hairy Lepidopterous larvae, known as *Tachina larvarum*. We got as early as 1905 a large supply of this species from Sardinia through the kindness of Silvestri and his late colleague Leonardi, and we expected excellent results from the known efficiency of this species in Europe. But it so happens that there is an American species, *Tachina mella*, which can not be distinguished by external characters from the European form but which is parasitic upon native American caterpillars. Early observations by the Massachusetts men showed that while this American *Tachina* lays its eggs rather freely upon the gipsy moth larvae it can not be reared from this species, since the eggs are cast off with the skin by the caterpillar in molting before they have a chance to hatch. There can be no doubt that the introduced European form interbred with the American form and that the offspring lost the power of parasitizing the tough-skinned and bristly gipsy moth larvae.

Another instance of curious and somewhat similar nature occurred with a Tachinid which was brought over from Europe and colonized in 1907-1908 and which we have been calling *Parexorista chelonae* but which, according to Webber, is in reality a distinct though closely allied species which he calls *Carcelia laxifrons*. It is our belief that, just as with the big European and American Tachinids to which we have just referred, the European form has interbred with a closely allied

American form, the European stock being practically absorbed. It seems that the native species can not successfully attack the brown-tail moth. But we are still breeding a few specimens, and in fact from 1911 to 1923 it has been found in small numbers annually. Webber suggests that in some individuals of the interbred form the European stock predominates, enabling them to attack the brown-tail moth. It may possibly be, however, that those recovered now are pure-bred and that for unexplained reasons the conditions over here are not favorable for their increase.

This leads us to another point, and that is that it is probable that with certain forms, although the climatic conditions in one season or another, or general conditions, may be suitable to the host insect and may favor its rapid increase, they may be distinctly unfavorable in some particular to the parasite. The possibilities in this direction are numerous but are very difficult to point out and to distinguish. We know as a simple and elementary fact, for example, that while plant-lice should breed more rapidly in sunny weather, as a matter of fact they breed more rapidly in damp, rainy weather. This does not mean that these climatic conditions favor their increase, but that they have just the opposite effect with their important parasites of the Braconid group Aphidiinae. In sunny weather the parasites increase more rapidly than the aphids; in damp, rainy weather the parasites can not fly about, and the plant-lice increase.

In fact, the more we study climatic conditions and weather changes, the more we find that they influence the increase or decrease of parasites; and further, we must acknowledge that when a host insect has increased to enormous numbers and then begins rapidly to subside we must not, even in the face of what seems to be a plain case, attribute this great decrease to the action of insect enemies only, even if these have been increasing at a more rapid rate than the hosts, since climatic factors may have been working on both hosts and parasites and since the important factors of over-crowding, starvation and disease have been working on the hosts.

It may be as well here to say something about parasites in the sense in which economic entomologists have used the name. It has been pointed out by certain students of the newly formed grouping of studies known as parasitology that a true parasite is one which lives with and upon or within its host without causing the immediate death of the latter. This is the extreme to which parasitism has reached and necessitates an immensely long association. With the true insects parasitism as thus defined exists rarely if at all. Hence, as compared with certain other organisms, it is argued that the assumption of parasitism is relatively recent with the insects. The extreme parasitologist would class what we call parasitism every day with the insects as

a modified predatory habit. Just as we find the larva of *Scutellista* within the body of the female black scale feeding actively upon the eggs, so we find the larva of *Apanteles* feeding internally but as an active predator upon the tissues of the caterpillar which it is really destroying. But the parasitologists, in broadening their view and in the effort to increase the scope and importance of their studies, are greatly broadening the use of the term and are bringing into their publications all sorts of forms which are in reality nothing but predators (for instance, see the last edition of Brumpt's "*Précis de Parasitologie*" or any number of the *American Journal of Parasitology*). There really seems no reason why entomologists should abandon their old understanding of the use of the term *parasite* as opposed to *predator*, even though there is a point where it is difficult to distinguish whether the species under consideration should be considered as belonging to the one class or to the other. It is hardly fair to say, as it has recently been put, that the entomologists consider an insect a parasite where it has a single individual host or destroys in one way or another a single individual insect, and a predator when it destroys several. We have the idea sufficiently clear in all our minds so that exact definitions perhaps are unnecessary.

What we call parasitism occurs with several orders of insects. In the Hymenoptera it predominates with a whole group of families and superfamilies. With the Diptera, we find it notably with the Tachinidae but also with eight or ten other families. With the Coleoptera, true parasitism occurs with at least three families while other families consist of noted predators. Practical experiments in international transportation have concerned themselves almost entirely with insects of these orders, although we tried a number of years ago to bring *Raphidia* from Australasian regions, and only recently failed in a rather large-scale experiment to introduce the very strange little *Ithoniids*, which Doctor Tillyard has so successfully studied, from New Zealand into the United States. It seems, by the way, rather strange that no international work has been suggested with the predatory Heteroptera. Recent developments in Porto Rico and Australia with regard to Scarabaeid larvae which damage the sugar-cane plantations have indicated the great desirability for close study of those so-called wasps of the family *Scoliidae* which in their larval state feed upon white grubs and may be said to afford an instance of a family rapidly verging towards parasitism. And the importance of this particular group of parasites or pseudoparasites is enormously emphasized at the present moment, when we are trying in every way possible to secure effective enemies for the Japanese beetle in this country.

As yet we have no good way of estimating the probable value

of the Scoliids or of their adaptability to international work. Wolcott, in his attempts to introduce United States forms into Porto Rico, has met with practically no success; and the only instance in which strikingly good results have been claimed has been the case of *Scolia manillae*, which the Hawaiians have brought from the Philippines into the Hawaiian Islands to destroy the earth-inhabiting larvae of a *Anomala* beetle which is injurious to many plants. In talking with Mr. C. P. Clausen, just returned from Japan and Korea, I asked his opinion of the value of *Tiphia* as an enemy of white grubs, and he told me that in a state of nature in Korea he considered that it destroyed perhaps twenty per cent of the grubs. When I asked him what enemies *Tiphia* had in the state of nature which might prevent its increase, he told me of a hunting wasp which stores its nests exclusively with adult *Tiphias*, and he also mentioned the destruction of the *Tiphia* larvae by the same fungous disease which destroys the grubs in the earth. He also reminded me that the literature contains references to Hymenopterous parasites, and also to the destruction of the wasp in its cocoon by Rhippiphorid beetles and by Mutillids as pointed out by F. X. Williams.

Possibly the most elaborate work with Scoliid parasites that has been done during the last few years has been by Charmoy in the Island of Mauritius, where the sugar cane is seriously attacked by *Oryctes*. Several species of Scoliids have been introduced from Madagascar and from the Antilles, and two or three of them have become established. It is difficult to estimate the exact amount of control which they have exercised as yet, since there is going on at the same time an expensive and extensive hand-collecting of the adult beetles, the sugar planters appropriating a sum equal to twenty-five thousand dollars each year. Very many millions of the beetles have been collected, thus rendering the work of the imported Scoliids easier. Charmoy makes the interesting point that, in order to concentrate the Scoliids at the points where they are most needed, it is desirable to establish artificial plantations of food plants of which the adults are especially fond, and considers that "It is useless to try and acclimatize Scoliids without supplying the appropriate flowers to serve as food for the adults."

With all of the parasitic insects we see varying degrees of adaptation, from a very rudimentary form down to the closest and most specific adaptation. This means to me that we can at the present day, by the study of this extreme range of variation, trace out the historical sequence of parasitism. With the species which we as economic entomologists have to consider we see very great variations in specificity of adaptation. There are certain parasites which are rigidly adapted to a single species of host, and from these we range

down to the very general parasites. All of them must be taken into consideration. With Hymenoptera, we have perhaps a greater range of variation than we have with the Diptera. If we study comparatively the host relations of the two orders we are impressed with the fact that with the Tachinids and the Dexiids each species apparently has a wide range of hosts. This must mean that parasitism with the Diptera was acquired later in the world's history than parasitism with the Hymenoptera, of which very many forms possess such specific adaptations to their hosts that their history must be a very long one.

Perhaps the most interesting feature to the biologist of the discovery of the cause of the Isle of Wight disease of the honey bees is the curious and extremely perfect adaptation of the parasitic mite to life in the tracheae of the honey bee and, presumably, of other Apoids. This indicates a very long history to this parasitism, the exact adaptation having been brought about obviously only after thousands of years.

But the *Acarapis* which causes the Isle of Wight disease is not an insect; and such a perfect adaptation between parasite and host occurs as yet very rarely among the true insects, although there is an article in the current number of the *Canadian Entomologist* (Oct., 1923) in which I have given an English résumé of the observations of the Frenchman Chopard concerning a European parasite of the common European Mantis, which offers an extraordinary instance of a very interesting adaptation.

Among the parasitic Hymenoptera, as we have stated, we have all degrees of adaptation: certain of them are very general parasites, attacking insects of several different orders; others (and in this we include not only species but genera and even families) have become adapted to some individual order or even families of insects; still others will parasitize generally the insects of a given group; while with still others the particular adaptation has extended so far that a single species will parasitize a single species of host and no other.

It early occurred to me in my studies that there was a very definite connection between the bodily structure of the parasitic Hymenoptera and their host relations, and I began a catalog of these host relations so far as they had been recorded anywhere in the world. It soon became obvious that while in certain groups the host relations were well fixed and apparently normal there were other groups whose parasitism was of such a general character that it seemed impossible that their diverse features should not be associated with morphological change, and I felt that from a close study of these relations we might be able to select groups for further morphological study with the probability that separating characters hitherto unused or unsuspected might be found to substantiate the correlation. As early as 1893 I published an introductory paper on "The

Correlation of Structure and Host Relation among the Encyrtinae." The paper itself was novel and sufficiently significant. It may be noted, for example, that in its analysis of the host relations of the as then constituted genus *Encyrtus* it was shown that there had been recorded twelve quite distinct types of hosts, eight of them occurring in Europe and all in America, and it was further pointed out that careful study would show the existence of probably as many distinct morphological genera. This in the course of years has proved to be the case, and the genera have been erected by one author or another.

It is interesting to note that fifteen years later C. T. Brues took up the same idea and prepared a paper entitled "The Correlation between Habits and Structural Characters among Parasitic Hymenoptera," following it three years later with one entitled "The Correlation of Taxonomic Affinities with Food Habits in Hymenoptera, with Special Reference to Parasitism." In this latter paper (which is not referred to in our bibliographical list, but which was published in the *American Naturalist* for March and April, 1921), Doctor Brues gives a very good discussion of the term *parasitism* as applied in entomology and goes rather deeply into the general subject. In his former paper he did not know of my 1893 article but followed out a number of the same ideas independently.

Reference should be made here to an important paper, entitled "Speciation and Host Relationships of Parasites," by Dr. A. C. Chandler (*Parasitology*, XV, pp. 326-339) in which parasites of vertebrates are considered and which brings out many important points. It is a very interesting essay from the neo-Lamarckian point of view.

It should be said here that there are certain elements in parasitism, which appear plainly to the careful student, which connect the parasitism not so much with the host insect as it appears in the system of classification adopted by entomologists as it does with the method of life of the host insect.

There are, for example, certain morphologically well defined groups of parasites, such as perhaps the majority of the species of the Chalcidoid families Eurytomidae and Torymidae, which are parasites of insects which live in galls, and these insects are not all necessarily of the great gall-making group, the Cynipidae, but they may be gall-making sawflies or Coleoptera or Diptera or Lepidoptera. The excitation to oviposition is not the morphological character of the host insect but the gall which it inhabits. In the same way there are parasites with which the same species lays its eggs indifferently in the cocoons of the Hymenopterous parasites of the subfamily Microgasterinae and in the silken pockets in the so-called webs of the brown-tail moth, an insect of another order. Here the excitation to egg-laying seems to

be the passing of the ovipositor through the silken cocoon or pocket.

It is fairly safe to assume that what may be termed a generalized host relation is more primitive than a highly specialized host relation, since the latter depends upon special adaptations which can only be acquired in the course of a very long time. But since we have all of these different intergradings existing between extremely generalized host relations and an absolute specificity we can not fail to conclude that we have on a large scale here species in the making under our very eyes, and, after species, genera and the higher groups. It is an interesting thought, although of course the same thing is happening all through nature; but here, it seems to me, we can get a somewhat clearer view of the process than elsewhere.

In the study of some of these forms having rather general host relations we have pointed out that there are very many forms of hyperparasites, and in the interrelations of these hyperparasites and their different hosts we find many perplexing problems for the person who is studying parasites with the idea of utilizing them. Since these secondaries attack other parasites and are in a measure indiscriminate in such attack, it often happens that a given species which is a detriment to our plans by destroying primary parasites in which we have a great practical interest may at any time become of value to us by attacking other secondary parasites.

A very interesting example of how a secondary parasite which, as such, is injurious to the interests of the crop grower, may become beneficial by becoming a tertiary parasite is shown very well in my studies of the parasites of the white-marked tussock moth (1897, U. S. Department of Agriculture, page 52), in which it is shown that *Dibrachys boucheanus* is a parasite upon *Pimpla inquisitor*, *Meteorus communis*, *Limneria valida* and *Apanteles delicatus* (all primary parasites of the tussock moth). It also destroys *Bathythrix pimplae* and *Spilochalcis debilis*, which are secondary parasites, thus in this role becoming itself beneficial to human interests.

We now come more directly to the subject of international transportation of parasites. As you will note from the bibliography, much has been written on this subject and it is very desirable that the historical accounts in particular be studied. The main questions to be considered in planning an importation have already been touched upon. It is possible that here we should say something about the phenomenon that has been termed "superparasitism" by Fiske, or "epiparasitism" by Haviland, or "accidental secondary parasitism" by Pierce. It is obvious that where we have two distinct species of parasites attacking the same host at the same time conditions are bad for the parasites, and that one of them will ordinarily succumb

in its larval life. In such cases a careful study should be made of the biology of each species in order to ascertain which of the two or more forms will prove the hardiest, will multiply the most rapidly and altogether possess the most important biological features; and then the others should be rejected in importation plans for a time at least. Such difficulties as this have occurred in actual practice in the importations of the parasites of the Mediterranean fruit fly into Hawaii. A certain species (*Opius humilis*) brought to Hawaii from South Africa is a useful species, but it suffers by competition from another Braconid which was introduced from Australia; and there is in addition still another Braconid and a Chalcidoid, all four being primary parasites of the fruit fly.

It seems obvious that the first forms for which we should search and which should be selected for importation are, if they can be found, exclusively specific parasites possessing few natural enemies of their own. I think this idea is generally admitted. The case becomes somewhat complicated when we are introducing at the same time specific internal parasites and predatory insects, since the introduced predatory species make no distinction between their prey when it is parasitized and when it is unparasitized. This was the idea which Berlese had when, after importing and establishing *Prospaltella berlesci* to kill off the mulberry scale and having made a success of this importation, he found that Silvestri, further south in Italy, was bringing in from other countries not only additional parasites of other species but predatory beetles. This was the beginning of the chasm between two former friends and coworkers and has resulted in two schools of economic entomologists in Italy, the one the Berlese school and the other the Silvestri school, between whom there has sprung up not only a great rivalry but a campaign of detraction which is very regrettable. I received, by the way, the other day from Raymond Poutiers of France a photograph of a group of delegates to an international conference on olive culture, and in the group were both Berlese and Silvestri. I hope that this may mean reconciliation.

An important thing which we must point out at this time is that we must not expect, and especially must we not predict, speedy success with introduced parasites. Speedy establishment we may hope for in many cases. Absolute control of the injurious form can be expected in the great majority of cases to come about only after the lapse of years if ever. We may, however, in many cases reasonably hope for a very considerable assistance from the introduced forms, an assistance which will help greatly with other measures towards the bringing about of measurable control.

We have already covered some of this ground, but we may point out categorically the following points which will interfere with prompt establishment, or rather, act in delaying results:

- (1) The necessity for a sequence of parasites with many host insects.
- (2) The necessity for a rather prolonged period of time to elapse before the parasite, introduced in comparatively small numbers and even with a greater rate of multiplication than its host, can catch up in numbers to the millions of the host insect.
- (3) The probable necessity for secondary hosts in the country to which the parasites are imported.
- (4) The possibility of the interbreeding of the imported forms with native forms or races, thus producing offspring which will inherit the capacities of the native species only.
- (5) Climatic conditions, either general or specific to a season, which, while not unfavorable to the host, may be very unfavorable to the introductions.
- (6) In the case of Scoliid wasps, the absence of flowering plants attractive to the adults.

I have emphasized these points for the reason that there is always the greatest call from agriculturists and horticulturists for speedy results. People whose property is being destroyed by hordes of insects are naturally impatient of delay. Basing their ideas on the many-times-published accounts of the success in California and elsewhere with *Novius* and the successes in Hawaii, many people, even including many of those of rather broad information, still expect speedy successes under all conditions, not considering in the least the points which we have just made.

In this connection there is much to be learned from a study of the work we have done with the parasites of the gipsy moth and the brown-tail moth. In fact, the laboratory at Melrose Highlands possesses a mass of notes, accumulated during the past nineteen years, which, when carefully studied, will throw much light upon many practical subjects as well as upon questions of great biological importance. Of the large number of species of parasites and predators which we have brought from all over Europe and from Japan, not more than half a dozen have succeeded definitely in becoming established and in spreading throughout the devastated area. For example, between 1906 and 1909 no less than eleven species of Tachinid parasites were imported in greater or less number and liberated for coloni-

zation in New England. Down to October, 1923, not a single individual of any of these eleven species has been recovered; but to offset this we have the extraordinary success of *Compsilura concinnata*, which has apparently received no check whatever in this country. It was liberated in 1906 and 1907 and has continued to spread and increase since that time. In the present year it is established all over New England and along the eastern border of New York State. This species, therefore, has acted just as we originally expected nearly all of them to act. It is curious to note, however, that even with this docile and valuable species our neighbors in Canada have had much more difficulty than we have had in Massachusetts. It was taken from Massachusetts and liberated in New Brunswick in 1911, but not until 1918 were Tothill and McLaine able definitely to state that the species had been established in Canada.

It becomes obvious, from the careful studies made by Webber and Schaffner of the host relations of *Compsilura concinnata* in America, that there is a hitherto unsuspected danger in the importation of such a catholic species as the *Compsilura*. I had been thinking of this species as one of the most valuable of our gipsy moth parasite importations, not only on account of its efficiency against the hosts for which it was imported but also on account of its adaptability to native Lepidopterous larvae of injurious habits. There is, however, an upsetting of the balance of nature in a way that was not previously considered. In its extensive parasitism of native hosts, it is antagonizing the native parasites of these hosts, either by superparasitism or by competitive parasitism. It is true that the native hosts are being killed, but it is also true that by this competition the native parasites are being reduced in numbers. This is a very curious complication. It reaches out almost indefinitely. Where the native parasites are specific, this competition may be harmful to human interests; where they are general, it necessitates a balancing of values and a consideration of the question as to whether the native parasites may attack injurious hosts which the imported parasite will not touch. Will this bring about a more specific relation of the native parasites to the hosts untouched by the imported parasites? Or will it destroy them by competition with them in the destruction of some necessary secondary hosts?

Of the hymenopterous parasites, we have established several species, but so far only two have done the work that was expected; these two, however (both species of *Apanteles*), have more than justified all the efforts which the government and the State of Massachusetts have made in this direction.

The same thing may be said of that extraordinary Carabid beetle known as *Calosoma sycophanta* which we first imported in 1906. Down to 1911, after careful rearing in confinement, we

had been able to liberate about eighteen thousand, adults and larvae. Since then the spread has been extraordinary. The beetle and its larvae feed not only on the gipsy moth but on many of our other native caterpillars, and it is interesting to note that the species has spread far beyond the limits of spread of the gipsy moth. When the big colony of the gipsy moth was discovered in New Jersey on the Duke Place, the *Calosoma* had arrived there—how, no one knows—and was at work apparently before the gipsy moth itself had been identified by the State or government entomologists.

Some of the other species imported have been apparently lost, but have suddenly come to the front after a lapse of years and have multiplied in numbers.

Quite recently, and in another field, there have been two instances of delayed establishment which have greatly encouraged us. I refer to the recovery of *Scutellista cyanea* in Louisiana the past year and of *Pleurotropis epigonus* in Maryland, Pennsylvania and surrounding States during the past few years. The *Scutellista* was sent me by Berlese from Italy in 1898 and was put out by Prof. H. A. Morgan at Baton Rouge that same year. It was never recovered in Louisiana until last year, when it was found parasitizing the black scale in New Orleans. It is perfectly true that in the meantime the same species had been brought from South Africa to California and there established as an enemy of the black scale on citrus trees and on the pepper tree; and it is quite possible that both the scale and its contained parasite had been brought into Louisiana from California. But there remains in my mind a strong probability that it became established shortly after 1898, and that the reason possibly that it was not discovered was that it transferred its principal attention to another of its European hosts, namely the black scale, whereas we were searching for it on the wax scale (*Ceroplastes*) on which it was originally liberated.

The *Pleurotropis epigonus*, the parasite of the Hessian fly, was sent over to Professor Riley by Frederick Enock in 1890, and was liberated first by Webster at La Fayette, Indiana, by Forbes at Champaign, Ill., and by Cook at the Agricultural College, Michigan. In 1894 another small sending was received from Enock, and the parasites were released at Cecilton, Md., and Fredericktown, Md. Only a single specimen was found in 1895, and from that time on until 1917—twenty-two years—it was not recovered. Then it was turned up at Fredericktown, Md., by Mr. P. R. Myers of the Bureau of Entomology. The species has now become one of the common parasites of the Hessian fly throughout Maryland, Pennsylvania, New Jersey and New York.

Here we have a delayed recovery of twenty-five years in the one case and twenty-two years in the other. I deem it quite

possible that perhaps a number of the parasites which we have brought over in former years for the gipsy moth, and for the recovery of which we have given up hope, may still be found and may still give us effective service.

Mr. Burgess attended the seventy-fifth anniversary meeting of the Entomological Society of Ontario a few weeks ago and read a very careful paper under the title "The Value of Insect Enemies of Injurious Insects," which will undoubtedly be published in full very soon in the Annual Report of the Entomological Society of Ontario. He includes in this paper a most interesting table showing parasites imported and the numbers in which they were liberated. From this table it appears that 73,643,341 individual parasites have been put out. This is a startling number, but it should be stated that all except about a million were of the two species of egg-parasites, namely *Anastatus bifasciatus* from Europe and Japan, fifty-three millions and a little over, and *Schedius kuanac*, twenty millions and a little over.

The last published historical account of the parasite importation work was the one which I prepared for the Yearbook of this Department for 1916. Since that time much work of interest and importance has been going on in different parts of the world. As to our own part in America, we began once more in 1920 the work with parasites of the gipsy moth and the brown-tail moth which had been interrupted by the outbreak of the World War in 1914. At that time our Mr. Summers was caught in Germany, and got back to this country with much difficulty. Since the resumption, Mr. Crossman and Mr. Webber have made two rather extended stays in parts of Europe, and Mr. Summers has twice visited Japan. It has been our desire to reproduce in this country the parasite environment of both gipsy moth and brown-tail moth both of Europe and of Japan. As I have pointed out, in the work before the war comparatively few of the parasites were established so far as we have as yet been able to ascertain. We wish to reintroduce the species which apparently failed to become established, and we wish also to complete the series.

The problem of the Japanese beetle has become so acute and has proved itself so difficult of solution that we are coming more and more to believe in the great importance of parasite introduction. Consequently Mr. Clausen has been in Japan and Korea for the past four years; Mr. King has been helping him; Mr. Fullaway and Mr. Illingworth have been added to the force, and work in China and India is contemplated; and in addition to all this a Russian entomologist, Mr. A. Znamensky, has been appointed, on the recommendation of Doctor Borodin, to take up work on the parasites of *Anisoplia austriaca*, a species allied to the Japanese beetle and which occasionally occurs in injurious numbers in southwest Russia.

It is hoped that the man who will be sent to India during the next season will take up again the effort to import from that country to this the little Mymarid parasite found by Mr. Woglum some years ago, which I described as *Prospaltella lahorensis*, but which failed of establishment in Florida.

Mr. Smyth has just returned from his second visit to Mexico, where he has been studying the native parasites of the Mexican bean beetle. He has found one Tachinid which is important in Mexico and which we hope to establish in the United States.

An effort on a somewhat larger scale is being made with the parasites of the European corn borer. After two years' preliminary work in Europe, principally at Auch (Gers), France, Dr. W. R. Thompson has established for the Bureau at Hyères a well equipped laboratory where at present he has two well trained assistants. They have been successful in their studies and have sent large quantities of parasitic material to this country.

For more than a year Mr. T. R. Chamberlin of the alfalfa weevil force has made his headquarters at this Hyères laboratory and has carried on a most careful study of the biology of a number of the European parasites of the alfalfa weevil. It is my earnest hope that this laboratory may be continued for a number of years at least, and that we may center there all of our studies of the native parasites of all of the injurious species common to the United States and southern Europe.

These are the highlights of the North American aspects of the work; but in the meantime we have been able to assist other countries. The little Aphelinine parasite of the woolly root-louse of the apple (*Aphelinus mali*), native apparently to the United States, has been established in France, South Africa, New Zealand and Uruguay, and promises to be of very considerable assistance to apple growers. This, briefly stated, brings us down to date. There are many other attempts being made in one way or another in different countries, but results so far do not justify extended notice. The striking successes down to the present time have been with *Novius cardinalis* in many countries, with several species of parasites in Hawaii, with *Prospaltella berleseii* in Italy and also in Argentina, with several of the gipsy moth parasites and the Calosoma beetle in this country.

As may possibly be gathered from this paper, much as has been done, the work is still in its infancy. It is a promising field and this factor will possibly prove itself to be one of the principal factors in the ultimate control of many of our most important insect enemies. So great are the possibilities that I look forward to the formation of a distinct section or division of the Bureau which will concern itself with these general problems. The section should include systematists like Rohwer, Cushman,

Gahan, Muesebeck, Myers, Aldrich, Webber and Greene, biologists like Thompson, Leiby, Hill and Timberlake, explorers and field men like Clausen, King, Fullaway, Smyth, Summers, Crossman and Muir, and as many others as may be required.

It should be the ultimate aim of such branch of the service to establish in America as many as possible of the parasites and predatory species of *certain* value from all foreign countries. To secure funds for such an effort will be difficult, but I do not despair of ultimate success.

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LEMA TRILINEATA OLIV. (COLEOP.) CONTROLLED BY AN EGG PARASITE.

BY F. H. CHITTENDEN, U. S. Bureau of Entomology.

While searching for the larva of *Lema trilineata* Ol. on *Datura stramonium* during the early autumn of 1915, the writer was surprised in finding none, although eggs and beetles were abundant. Eggs collected from time to time for rearing the larvae failed to hatch and then it was noticed that all eggs were dead. Finally the egg parasite, a very minute chalcidoid, was detected. It was determined by Mr. A. A. Girault as belonging to the eulophid genus *Emersonella*, and at the writer's suggestion, was named *lemae* and described the following year.¹

As early as 1838 Harris² recorded attack by *L. trilineata* on potato, calling the insect the "three-lined potato beetle," and stating that its numbers were sometimes immense and that potato leaves were covered and nearly consumed by the filthy larvae.

The species develops normally on *Datura* and feeds freely

¹Societas Entomologica, Vol. 31, July 21, 1916, p. 36.

²Economic Geology of Mass., by Edward Hitchcock, 1838, pp. 76, 77.

on certain other *Solanaceae*, such as *Solanum* and *Physalis*. For many years it has been injurious in the vicinity of the District of Columbia to belladonna, henbane (*Hyoscyamus*), and other medicinal plants and less troublesome on potato.

The abundance of this egg parasite clearly indicates the reason why the three-lined potato beetle is not more destructive, in this vicinity at least. As a result of the activity of the egg parasite, injury was much less severe in 1921 than in earlier years in localities where formerly it was reported on potato on numerous occasions. In 1921, aside from one small planting of belladonna, on which the insects occurred in numbers early in the season, the species was actually scarce and larvae were not seen during the heat of summer or later, all eggs being parasitized. For the first time in many years several experimental plats, including large plantings of Jamestown weed, grew to full maturity with scarcely any noticeable injury by this insect.

In 1922 the *Lemas* became very abundant early in the season and continued so until overcome by the egg parasite which destroyed them completely, as usual. In 1923, however, the beetles, as a result of this complete parasitism, were extremely rare until about the first day of July, when they were first seen. They did not become at all numerous until later in the season and then they were overwhelmingly outnumbered by the parasites. This shows the rise and fall in development of *Lema trilineata* in comparison with its hosts, paralleled in the case of other insects, as, for example, the *Vedalia*, now known as *Rodolia* [*Novius*] *cardinalis* Muls., an insect which practically keeps under complete control the fluted scale of California. As an example of other insects which seem to lead a similar precarious existence in recent years when compared with their natural enemies, may be mentioned the common cabbage worm (*Pontia rapae* L.), the tomato worms (*Phlegethontius* spp.), and in some regions, the Colorado potato beetle.

By July 19 egg masses were noticed that were parasitized by *Emersonella lemae*. From then on as in previous years all eggs were thus affected. September 5 a female was noticed laying an egg mass, which was carefully watched by Mrs. D. H. Blake to ascertain how soon the eggs would attract the *Emersonella* and a few minutes after beginning observations she called the writer's attention to the fact that an egg destroyer had appeared on the mass before all of the eggs were laid. In about an hour, six more parasites were at work on the same mass, showing the extreme activity of this parasitic species.

Before the discovery of this egg parasite, the natural conclusion reached by the writer as to the reasons why *Lema trilineata* was not a potato pest of importance was that it was being literally crowded out by *Leptinotarsa 10-lineata* Say and that it also perished when arsenicals were used against this more

important pest. In the light of our present knowledge, it is evident that the causes for its inactivity as a potato pest are three-fold: (1) Disturbance due to the far more aggressive Colorado potato beetle, driving it to other Solanaceae for food; (2) The use of arsenicals for the control of the Colorado beetle and (3) The activity of the egg parasite *Emersonella lemae*.

ANOTHER SEED-CHALCID ATTACKING THE CULTIVATED GRAPE.

BY A. B. GAHAN.

Mr. R. A. Cushman recently called to my attention a series of specimens of an Eurytomid taken by him at Vienna, Virginia, June 19, 1913, ovipositing in cultivated grapes which were approximately half grown. The grapes were not infested by any insect which might have served as host for a parasite and Mr. Cushman informs me there could be no doubt that the Eurytomids were ovipositing in the seeds and that he had assumed that they were probably *Evoxysoma vitis* (Saunders), the only recorded grape seed chalcid.

Comparison of the specimens with the types of *E. vitis* showed at once that a quite different species was involved. I have determined it as the *Prodecatoma phytophaga* originally described by C. R. Crosby as a seed chalcid infesting seeds of *Parthenocissus quinquefolia* (Virginia creeper) in New York (Can. Ent., vol. 49, 1909, p. 50). The record is interesting and important as indicating the probable occurrence in this country of two seed chalcids attacking the grape and also as apparently demonstrating that this species, at least, is not confined to a single host plant. The record needs to be verified, however, by actually rearing the species from grape seeds.

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A NEW GENUS AND SPECIES OF APHIDS. (HOMOPTERA.)

BY P. W. MASON, *U. S. Bureau of Entomology.*

While examining a collection of aphids in connection with a study of the genus *Amphorophora*, a certain species was observed to belong to a new genus. This species was sent by Dr. Edith M. Patch who had given it the manuscript name of *Amphorophora kalmiae*. It is described at her suggestion. It runs in Baker's generic classification to *Microparsus* Patch, from which it can be separated by its swollen cornicles and by the presence of media in the hind wings.

NEOAMPHOROPHORA, new genus.

Head with distinct, diverging, non-imbricated antennal tubercles. Antennae of six segments, armed with subcircular sensoria. Fore wings with the media once branched; hind wings with cubitus absent. Cornicles swollen. Cauda long, slightly constricted.

Type.—*Neoamphorophora kalmiae* Mason.

Neoamphorophora kalmiae, new species.

Alate.—(Plate 2, figs. A-F). Right antenna slightly shorter than body, dark colored, imbricated, hairs very small and inconspicuous, segment III with 26 sensoria, over entire length, not in a straight row, segment IV with 9 sensoria, over the entire length, not in a straight row, segment V without secondary sensoria. Antennal measurements as follows: III 0.400 mm.; IV 0.248 mm.; V 0.240 mm.; VI 0.168+0.320 mm. Left antenna missing. Antennal tubercles shorter than width of segment III. Vertex prominently developed. Beak reaching second coxae. Prothorax without tubercles showing. Veins of wings with a slight brownish tinge. Right cornicle missing. Left cornicle conspicuously swollen, tip imbricated, not reticulated, 0.352 mm. long; widest diameter 0.08 mm.; smallest diameter 0.032 mm.; flange 0.040 mm. Cauda 0.224 mm. long, narrow, slightly constricted, with two sets of lateral hairs.

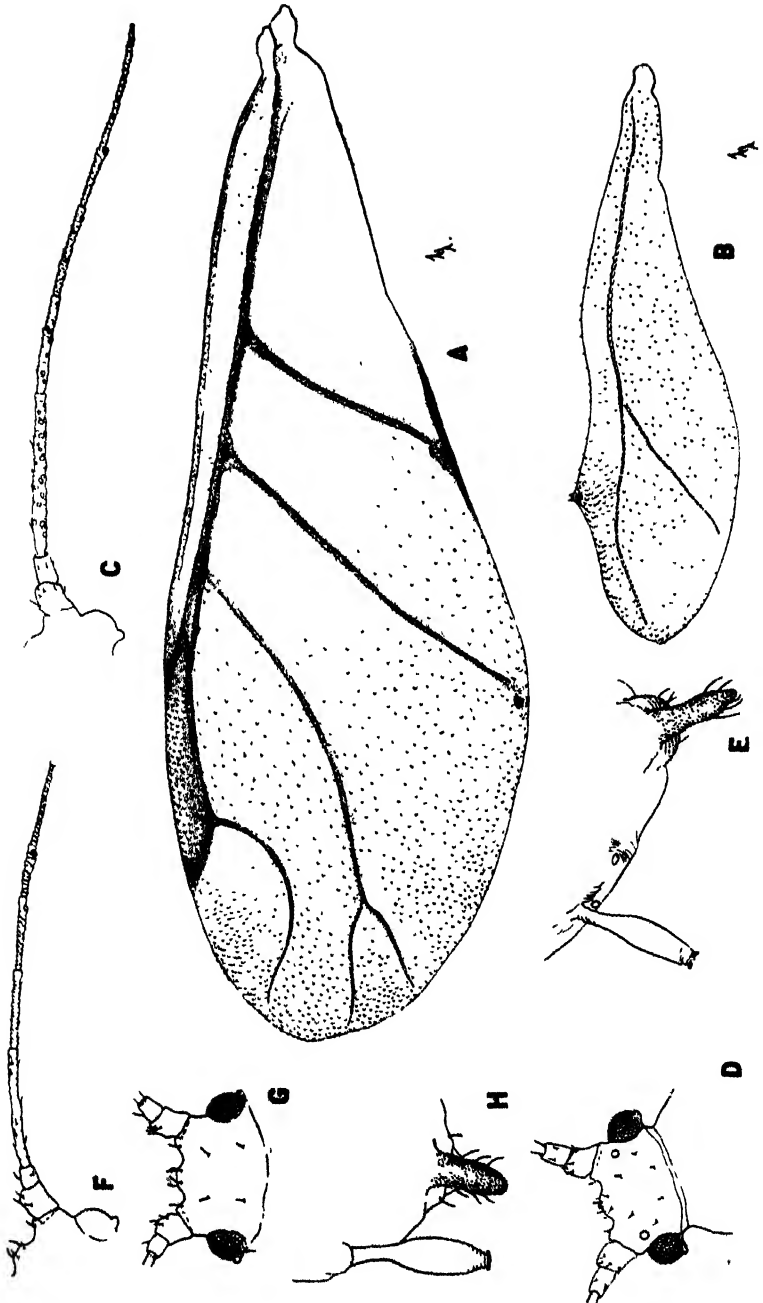
Apterous viviparous female.—(Plate 2, figs. F-H). Antennae shorter than body, faintly imbricated, light colored, segment VI somewhat darker, hairs inconspicuous, shorter than width of segment, no secondary sensoria present, segment I somewhat protruding on inner side. Antennal tubercles about as long as width of segment II of antennae. Vertex prominently developed. Beak reaching somewhat beyond second coxae. Abdomen with large dark, dorsal patch. Cornicles of moderate length, heavily and rather suddenly

swollen, the tip darker, imbricated but not reticulated, a distinct flange present. Cauda long and slender, slightly constricted, two sets of lateral hairs. Measurements as follows:

No.		III	IV	V	VI
1	Left	0.304	0.192	0.192	0.120 + 0.216
	Right	0.304	0.192	0.192	0.112 + 0.224
2	Left	0.224	0.144	0.144	0.096 + 0.192
	Right	0.208	0.144	0.128	0.096 + 0.192
3	Left	0.192	0.128	0.144	0.096 + 0.208
	Right	0.192	0.120	0.144	0.096 + 0.192
4	Left	0.248	0.184	0.160	0.096 + 0.224
	Right	0.264	0.168	0.168	0.112 + 0.224
5	Left	0.280	0.176	0.176	0.104 + 0.224
	Right	0.272	0.184	0.160	0.104 + 0.224
6	Left	0.304	0.208	0.208	0.128 + 0.224
	Right	0.312	0.224	0.192	0.120 + 0.232
7	Left	0.176	0.128	0.128	0.096 + 0.192
	Right	0.192	0.120	0.112	0.096 + 0.192

No.		Head	Cauda	Cornicle			
				Length	Widest diameter	Smallest diameter	Flange
1	Left	0.432	0.224	0.400	0.112	0.032	0.048
	Right			0.416	0.112	0.032	0.048
2	Left	0.368	0.224	0.368	0.104	0.024	0.032
	Right			?	?	?	?
3	Left	0.344	0.192	?	?	?	?
	Right			0.352	0.080	0.032	0.040
4	Left	0.368	0.216	0.432	0.136	0.024	0.032
	Right			?	?	?	?
5	Left	?	0.224	0.400	0.120	0.032	0.040
	Right			?	?	?	?
6	Left	0.424	0.272	0.432	0.128	0.032	0.048
	Right			0.416	0.128	0.032	0.040
7	Left	0.336	0.208	0.336	0.088	0.024	0.040
	Right			0.336	0.088	0.024	0.032

Described from one alate and several apterous viviparous females taken by Miss Patch at Orono, Maine, on *Kalmia augustifolia* (Maine numbers, 68-18, 100-18, 105-18, 216-18, 284-18, 343-18). The alate was taken on June 18 (mixed collection). The other collections were June 25 (apterous viviparous females with young, June 28 (apterous viviparous females and young, some with wing-pads), July 23 (apterous viviparous females), August 5 (apterous viviparous females and nymphs). Miss Patch writes that they were apparently common in 1918 on the under side of the leaves. She sends the following color notes of the apterous form, "general body color yellow, large dark



brown patch on dorsum of abdomen. Collar with dusky transverse mark. Cornicle pale or brown. Nymph pale yellow."

Type.—Deposited in the U. S. National Museum, No. 26381. Cotypes returned to the Maine Agricultural Experiment Station.

EXPLANATION OF PLATE 2.

Figs. A-E—*Neoamphorophora kalmiae* Mason. (Alate.) A—Forewing. B—Hindwing. C—Antenna. D—Head. E—Cornicle and cauda.

Figs. F-H—*Neoamphorophora kalmiae* Mason. (Apterous female.) F—Antenna. G—Head. H—Cornicle and cauda.

A NEW SPECIES OF CANACEA FROM THE UNITED STATES (DIPTERA: EPHYDRIDAE).

By J. R. MAILOCH.

The genus *Canacea* is distinguished from other Ephydriidae by the presence of a complete anal cell in the wing. There is no species of the genus definitely listed from North America.

Canacea macateei, new species.

Male and female.—Black, densely pale gray pruinulent. Frons when seen from behind lead colored, the triangle slightly shining; occiput paler gray; face and cheeks white; antennae and arista black; palpi yellow. Dorsum of thorax with a brownish tinge down center. Abdomen greenish gray, hypopygium of male brownish. Legs black, gray pruinulent, tarsi yellow, apical segment partly grayish. Wings grayish hyaline, veins fuscous. Halteres whitish.

Frons three-fifths of the head width; each orbit with about four long fine bristles curving outward over eye; triangle extending to anterior margin of frons, the margins with several long setulae on the entire length; ocellar and postocellar bristles as long as the interfrontals; frons protuberant in profile; cheek at genal bristle about one-third as high as greatest height of eye, the lower margin with about three bristles, a strong upwardly curved one near vibrissa about as long as the genal bristle; arista pubescent, about as long as antenna. Thorax with four pairs of dorsocentrals between which there are four irregular series of short hairs, the median two series the longest; prescutellar pair of acrostichals distinct; scutellum with four marginal bristles, two shorter bristles and some fine hairs on disc; mesopleura and sternopleura with short sparse hairs, the former with two or three long posterior bristles, the latter with one long bristle. Abdomen with six or seven distinct tergites, the second not distinctly differentiated from the rudimentary first, and distinctly longer than any of the others; hypopygium of male with the claspers subtriangular, genitalia on female with a pair of long chitinized hooks. Fore femur in both sexes with three or more short stout bristles on apical half or more of anteroventral surface. Inner cross-vein a little beyond basal third of discal cell; outer cross-vein at less than its own length from apex of fifth vein.

Length, 3-3.5 mm.

Type.—In U. S. National Museum (Cat. No. 26883).

Type, male, allotype, and a large series of paratypes of both sexes, Jekyll Is., Georgia, June 23, 1923 (W. L. McAtee). Named in honor of the collector.

A NEW GENUS AND SPECIES OF THE NOTOPTEROUS FAMILY GRYLLOBLATTIDAE FROM JAPAN.

BY A. N. CAUDELL AND J. L. KING, *U. S. Bureau of Entomology.*

INTRODUCTION.

During the summer of 1922, while in Seoul, Korea, the junior author had the pleasure of meeting the Honorable Edme Gallois, French Consul General for Korea. Monsieur Gallois has long been an enthusiastic entomological collector in Japan. During the course of a conversation M. Gallois spoke of an interesting insect he had taken in Japan and which he was unable to place as to family, however, he considered it an Orthopteron. From M. Gallois' verbal description the writer immediately placed the insect in question as possibly a species of Walker's genus *Grylloblatta* or a type closely allied to it. Subsequently on seeing the specimens, one male and one female, this conjecture was confirmed. Through the information thus gained it was possible later to secure specimens and with the kind consent of M. Gallois the following new genus and species are here described.

DESCRIPTIONS.

~~MA~~ GALLOISIA new genus.

Differing conspicuously from the nearctic genus *Grylloblatta* Walker in the rather remarkable tarsi, which in this new genus have the segments broad and furnished with a pair of articulated apical flanges on each segment except the fifth where there is a similar one but apparently not doubled; these projections are probably homologous with the tarsal pads, usually known as pulvilli, of many insects. Their appearance is shown by the accompanying illustrations, pl. I, figures 2 and 3, and they are described somewhat more in detail in the description of the species.¹ In *Grylloblatta* the tarsal segments are simple and without pulvilli, as shown by figures 4 and 5. Other characters of probable generic value, but less striking than the tarsal structure, are found in the cerci, which are nine segmented and much longer in proportion than the eight segmented ones of *Grylloblatta*, and the antennal segments, the third of which is about three times as long as the preceding one while in the nearctic genus that segment is scarcely longer than the second. Male only studied.

Type of genus.—*Galloisia nipponensis*, new species.

¹Similar articulated appendages are found in certain other insects, as *Campionotus carolinensis* Gerst. of the Orthopterous family Gryllacrinae.

***Galloisia nipponensis*, new species.**

Description of adult male (from a dried specimen).—Head somewhat blattoid in form, moderately flattened and attached obliquely to the thorax; epicranial sutures distinct. Eyes very small, not very clearly defined, scarcely as large as the basal segment of the antenna, irregularly elongate in form and consisting of about 50 or 60 distinct fascetts, the whole very abortive in appearance. Ocelli absent. Maxillary palpi with five segments; basal segment subquadrate, 2d slightly elongate, 3d about as long as 1 and 2 together and moderately clavate, 4 and 5 subequal in length, each slightly shorter than 3 but similar in shape, the 5th more narrowly rounded apically, but less swollen. Labial palpi with three segments, the segments subequal in length, each about three times as long as broad and shaped about as in the last three segments of the maxillary palpi, but not quite so large. Clypeus subquadrate, but little broader than long, the cephalic half mesially membranous. Labium semicircular, the cephalic margin rounded. Antennae broken off, one at the 10th and one at the 14th segment, but each probably consisting of 40 segments, the number found in nymphs; the basal segment is moderately flattened, strongly so basally, and nearly twice as long as thick when viewed from the narrowest aspect, the broadest view making it subquadrate, the whole much larger than any of the other segments; second segment cylindrical and subquadrate; 3d segment cylindrical and elongate, being about three times as long as broad and about three times as long as the second; fourth and several following segments subquadrate or but little longer than broad, those towards the apex, judging from the antennae of nymphs, growing more slender and elongate.

Thorax very moderately convex dorsally; sternal plates small and well separated; pronotum slightly longer than broad, gently narrowed from in front backwards, the lateral margins very slightly rounded, the disk gently convex, the anterior margin very broadly rounded, the hind margin more narrowly rounded; near the anterior margin of the pronotum is a sinuate transverse sulcus; mesonotum about as long as the posterior width, anteriorly much narrower than posteriorly, the posterior width about equaling that of the posterior width of the pronotum; lateral margins nearly straight, the posterior margin gently concave; metanotum similar to the mesonotum in shape but slightly shorter.

Abdomen rather heavy, elongate, broadest mesially and with ten dorsal sclerites each with a few stout spinules situated near the sides; the tergites do not overlap the sternites, being separated by a pleural membrane; terminal dorsal segment descending laterally to embrace the cerci at their bases, apically acute triangular, the apex prolonged into a decurved subcylindrical, bluntly pointed projection twice as long as its basal width. In the nearctic *campodeiformis* this segment is apically rounded triangular, without any decurved prolongation. Pl. 3, fig. 1, shows this character of the species now being described. Coxities present as flattened plates the tip of each bearing a style; the left coxite is subtriangular and basally extending across barely more than half the width of the abdomen; the right coxite is elongate-triangular basally, decidedly more elongate than the left one, and apically narrowed into a cylindrical neck to which is attached the style; basally the right coxite is a little more than half as broad as the corresponding portion of the left coxite, and is without a chitinous process as described in Walker's *Grylloblatta campodeiformis*. Styles

simple, cylindrical, about five times as long as broad and apically bluntly pointed and bearing several slender spines noticeably longer than the width of the style. Cerci each with nine segments, the basal two being very closely united; the entire cercus is slightly more than twice as long as the posterior tibia; the basal segment is but slightly longer than broad, basally much swollen; 2d segment about twice as long as broad, and, like the rest, cylindrical; the other segments gradually growing longer and more slender, the terminal being about ten to twelve times as long as broad; there is an irregular ring of about three to six stout setiform spinules on each segment beyond the basal except the last where there is a single ventro-apical one, though broken off of the specimen here described, the socket only remaining; these spinules are somewhat longer than the cercal width at point of attachment, some of them about twice as long; the basal segment bears a single sub-dorsal spine, shorter than the others.

Legs stout, with rather heavy brownish yellow armature, the femora and middle and hind tibia armed dorsally with spines scarcely less stout than the ventral ones, the anterior tibia however furnished dorsally with hairs only, or with fine setae. Coxae large and armed beneath and laterally with numbers of fine spinules; anterior coxa longer than the others, being about two and one-half times as long as broad and about one-fourth shorter than the pronotum, the ventral margin is straight, the dorsal one convexly rounded, the widest point at the basal third; intermediate coxae a third shorter than the anterior ones and truncate-conical in shape; posterior coxae very like middle ones but a little longer. Trochanters oblong rounded cup-like plates, the anterior ones apically subtruncate, the others apically rounded, each about twice longer than broad and the middle and hind ones with two or three very short fine spinules near the apex. Anterior femora about three times as long as wide, mesially decidedly broadened; armed beneath on the inner margin with about a dozen short and rather stout spines and above with about as many moderately slender setae arranged in two longitudinal rows. Intermediate femora a little shorter than the anterior ones and scarcely as broad; armed beneath with seven or eight stout spines on each margin and above with nearly a score similar spines roughly arranged in four longitudinal rows of three or four each except the intero-dorsal row where there are seven; most of these dorsal and lateral spines are fully as stout as the ventral ones. Posterior femora very like the intermediate ones and similarly armed.

Anterior tibia somewhat shorter than the corresponding femur, unarmed above but armed beneath with four or five rather stout spines on each margin and with two ventro-apical spurs, the inner one the longer, being as long as the basal tarsal segment, and the outer one situated almost on the median line of the tibia. Middle tibia slightly longer than the fore ones, the ventro-apical spurs subequal in length and the outer one not set in towards the median line; the dorsal surface armed with spines scarcely smaller than the ventral ones. Hind tibia similar to the intermediate ones but a little longer.

Tarsi differing conspicuously from those of the known material of the nearctic *campodeiformis* in which species the tarsal segments of all recorded specimens are simple, cylindrical and without pulvilli, while in the species now being characterized they are laterally expanded and the basal four are each furnished with a pair of partly membranous, laterally haired, lobe-like articulated ap-

pendages; the fifth segment bears a somewhat similar lobe, but apparently single and more membranous, which is situated about the middle of the ventral surface; the accompanying figures, pl. 3, figs. 2 and 3 of the right posterior tarsus of this insect, with a drawing of the corresponding tarsus of *campodeiformis*, pl. 3, figs. 4 and 5, for comparison, show the characters better than any description. The membranous portions of these pads shrivel to insignificance when dried, that of the fifth segment becoming practically invisible, but the chitinous parts, especially of those of the basal four segments, remain evident, though shrunk and more or less curled. The basal segment of the posterior tarsus is sub-cylindrical and broadening from the base outwardly, being about three times as long as the apical width, armed with three ventral spines on the inner side and four on the opposite side; on the inner side there is also an apico-lateral spine and the right tarsus has also an apico-lateral spine on the inner side but this is absent from the left tarsus, the absence of a socket indicating it was never present; second and third segments slightly more flattened and decidedly shorter, being less than twice as long as the apical width and basally narrowing into a cylindrical neck as shown in the figures; the second segment is armed with four apical spines, two ventral and two lateral, and the third with but two ventral spines; fourth segment similar to the preceding two but still shorter, being no longer than broad and without spines, only heavily haired as are all the segments; fifth segment much narrower than the others, much depressed and elongate, being about two and one-half times as long as broad. Intermediate and anterior tarsi similar to the posterior ones as described above except the segments are shorter, the basal segment of the middle foot being about twice as long as the apical width and that of the fore foot still shorter, and the basal segment of the anterior tarsus of both legs being without an apico-lateral spine on the outer side.

The claws are about three-fourths as long as the terminal tarsal segment, rather slender and with a microscopic triangular basal tooth.

This insect seems less campodeiform than shown by Walker's figures of the nearctic species, but in general appearance in life it is probably very similar. The general color is yellowish. The decidedly stouter spines of the entire insect, especially the legs, the structure of the antennae and of the last dorsal segment of the abdomen, and especially the tarsal formation should enable even the tyro to separate with assurance this Old World form from its New World relative.

Length, entire insect to tip of abdomen, about 21 mm.; pronotum, 4 mm.; fore femora, 3.9 mm.; fore tibia, 3 mm.; posterior tibia, 4 mm.; posterior femora, 4 mm.; cercus, 9 mm.; width, head, 4 mm.; pronotum, anteriorly, 3.5 mm.; mesonotum posteriorly, 3 mm.

One adult male, the holotype, taken at Chuzenji, Near Nikko, Japan, by J. L. King on September 15, 1922.

Type.—In collection, U. S. N. M., Catalogue no. 26848.

Nymph.—Besides the type there are two male nymphs evidently belonging here, taken by Mr. King and also deposited in the collection of the U. S. National Museum. These are more nearly like the described specimens of *campodeiformis*, the tarsal segments being cylindrical and without the remarkable ap-

pendages of the adult form of the present species, being similar to those of *campodeiformis* here figured; the eyes are black and more compact than in the adult; antenna about 7 mm. long and consisting of 40 segments, the third less elongate than in the adult, being less than twice as long as broad, and those immediately following are broadly transverse, those towards the apex becoming more elongate, those beyond about the middle of the antennae being subequal in length, each about three or four times as long as wide, the terminal one more narrowly rounded apically than the others. The basal two or three segments of the cerci are so closely united as to be distinguished with much difficulty, a rather careful examination failing to show with any clearness more than 8 segments, though there are really 9, the basal one being fused with the second and without spines, the rest armed as in the adult but the spines more slender. Coxites more nearly equal in size and more similar in shape than those of the adult and the terminal dorsal segment of the abdomen is apically rounded-triangular. The larger of these nymphs, marked paratype A, was taken at the same place and date as the type; the other, paratype B, was taken at the type locality on May 11, 1923.

REMARKS

Collecting dates.—Gallois' specimens were taken at Chuzenji, near Nikko, Japan. His collection dates are as follows: One adult male August 26, 1915, one adult female and a small nymph September 27, 1916. The Junior writer made two special trips to this same locality, one on Sept. 15, 1922, and secured one mature male and one nymph; the second trip occurred on May 11, 1923, which resulted in the capture of two additional nymphs.

Type locality and Habitat.—The type locality of this interesting insect is set in one of the most delightful mountain regions of Japan. The entire region is of volcanic origin and forms what is known as the Nikko Mountains. Chuzenji is a small settlement at the eastern end of the beautiful crater lake Chuzenji which has an elevation of some 4,460 feet. All specimens herein mentioned were taken on slope of Nantai San, a mountain which rises as a distinct peak from the eastern lake border, thus making the actual altitude where specimens were taken between 4,500 to 4,600 feet.

The forest in this particular region is old and little disturbed and at this altitude is quite similar to our northern American deciduous forests. The dominant species of trees occur in the following genera, *Fagus*, *Quercus*, *Acer*, *Cornus*, *Tillaea* and *Alnus* with a sprinkling of *Betula* and *Abies*. The lower vegetation, or ground covering plants consist largely of a dense growth of broad leaved bamboo about two feet in height, however such plants as *Aconitum impatiens* and several species allied to our *Cimicifuga* and *Podophyllum* manage to grow where conditions are unfavorable for the dominant bamboos.

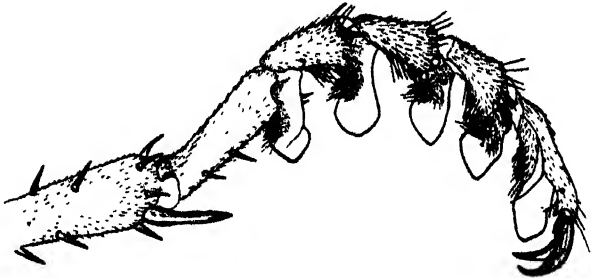
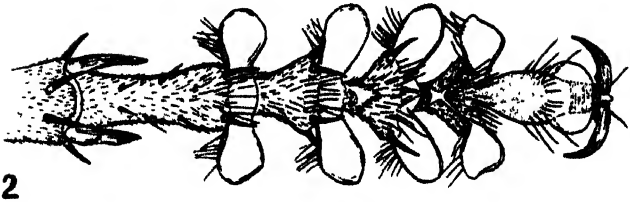
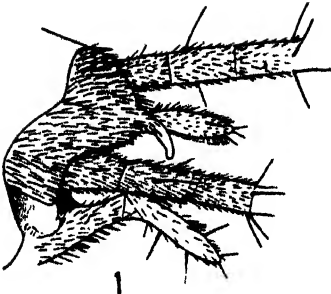
Habits.—The three immature specimens taken by King occurred under decaying logs in small natural cavities, no

distinct or special runways being observed. The only mature specimen taken was a male. This was found well within the heart of a great log which had been previously perforated by other insects.

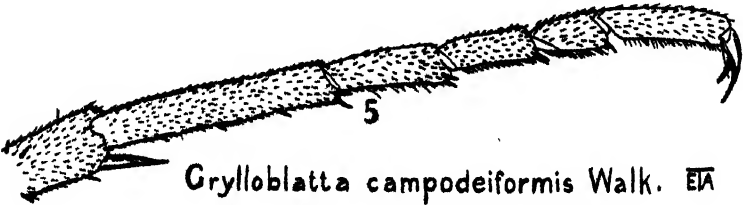
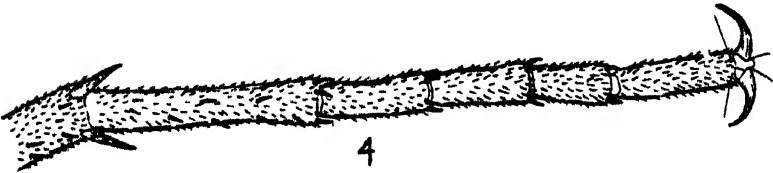
Although at the time of collecting the weather was cold and the ground frosty, the insects were active. Their movements are rapid and may be compared to the cockroaches for agility. In captivity they are most active at night.

The two immature specimens collected May 11th, 1923, were kept alive for about one month in glass jars containing decaying wood and leaf mold. During this time they were taken from Japan to Korea with the hope that they could be reared to maturity. Attempts were made to feed them on numerous food stuffs such as fungi, tender plant tissues living and dead, starches, meats and small soft bodied insects both dead and alive; however, all seemed to fail and the specimens became less active and shrunken, finally one escaped and it was deemed wise to preserve the remaining one before it too was lost or injured.

Relationship.—The rather extraordinary tarsal structure of the adult of the above described species, considered in connection with the other less striking characters mentioned in the foregoing article, fully warrants the consideration of this genus as distinct from *Grylloblatta*. Indeed were it not for the fact that the value of a given character in the taxonomics of one group can not be taken as a criterion for judging the value of the same character in another group one might be justified in considering this tarsal formation as of even more importance than that herein assigned it. If this character existed in the nymphs as well as in the adult the present writers would consider it as of family or subfamily importance. Several detailed studies of the anatomy and phylogeny of *Grylloblatta campodeiformis* have been published by Drs. F. M. Walker and G. C. Crampton, neither of whom seem to have doubted the maturity of some of the material discussed. But studies made in writing the present paper has caused the senior author to rather seriously doubt if the real adult of the nearctic form is yet known, as in such case one would expect the tarsi to conform somewhat in structure to that of its palearctic relative. If it eventually results that the material of *campodeiformis* described as adult is actually fully matured and has tarsi similar to those of *Galloisia* as herein described and figured, this new genus will lose its most important diagnostic character. In such case, however, the other characters mentioned in the above description, together with additional ones which will very likely result from comparative studies of true adult material of both genera, will probably prove fully sufficient for the separation of this Old World genus from the New World *Grylloblatta*.



3 *Galloisia nipponensis* n.sp.



Grylloblatta campodeiformis Walk. ♂

Walker¹ erected the Family Grylloblattidae for his genus *Grylloblatta*, considering it as belonging to the Order Orthoptera. The following year Brues & Melander² raised this group to ordinal rank, calling it Grylloblattoidea. Later in the same year³ Dr. Crampton arrived at the same conclusion, but erected for it the new name Notoptera. In papers of later date Walker and Tillyard have followed Brues and Melander in their use of the ordinal name Grylloblattoidea. A continuance of this usage is scarcely to be recommended as the termination "oidea" is, or at least should be, used for the ending of superfamily names. Notoptera is therefore decidedly preferable and should be used as priority in ordinal names is not obligatory under prevailing codes of nomenclature.

The wide distribution of the Notoptera as indicated by the above Japanese record strongly substantiates the idea of the antiquity of the order. This record adds to the group its second genus and the first record of its occurrence outside of the North American Continent.

EXPLANATION OF PLATE 3.

- Fig. 1. *Galloisia nipponensis* new species. Adult male. Dorso-lateral view of end of abdomen.
 Fig. 2. *Galloisia nipponensis* new species. Adult male. Ventral view of right hind tarsus.
 Fig. 3. *Galloisia nipponensis* new species. Adult male. Lateral view of right hind tarsus.
 Fig. 4. *Grylloblatta campodeiformis* Walker. Male nymph. Ventral view of right hind tarsus.
 Fig. 5. *Grylloblatta campodeiformis* Walker. Male nymph. Lateral view of right hind tarsus.

NEW SPECIES OF MYTHICOMYIA AND ITS RELATIONSHIP, WITH A NEW GENUS (DIPTERA).

BY CHARLES T. GREENE, *U. S. Bureau of Entomology.*

The new genus described below is so closely related to the genus *Mythicomyia* that I think it would be almost impossible to separate the two in the immature stages. Therefore I think the pupal characters below would hold just as well for the genus *Mythicomyia*. As this latter genus has always been in an unsettled state in regard to its location, I am giving my opinion on the location from the adult characters plus those of the pupa.

¹1914, March. Can. Ent. vol. xlv, pp. 93-99, pl. vi.

²1915, March. Keys to the families of North American Insects, pp. 1, 10, 13, pl. ii, fig. 19.

³1915, October. Ent. News, vol. xxvi, pp. 346, 347.

From the material before me it appears that the genus *Mythicomyia*, having a distinct discal cell and slender antennae, occurs only in the southwest; while the closely related genus *Pachyneres*, which has the discal cell confluent with the second basal cell, and the short thick antennae, occurs in the east and extreme northwest.

The genus *Mythicomyia* has been placed in three different families by various authors. These authors seem to think that this genus should be located directly after the genus *Hilarimorpha*. At first Williston¹ states that "Osten Sacken and Schiner locate the latter genus in the Leptidae. If that view is accepted, *Mythicomyia* should probably follow it." Williston² later figured *Mythicomyia* under the families Bombyliidae and Leptidae. It appears that he left it to some future worker to say in just which family the genus should be placed. Melander³ placed the genus in the Empididae. Coquillett⁴ also placed the genus in the Empididae. Cresson⁵ places this genus in the Empididae, stating that he thinks "Coquillett was correct" in placing it here. Aldrich and Kertész place both genera in the Leptidae.

From the characters of the pupa the genus should be placed more properly in the Bombyliidae than in the other families. All of the pupae of the Bombyliidae which I have studied have two, sharp, chitinous projections at the apex of the abdomen and numerous long, brownish-yellow hairs on the abdomen. Fig. 3. These hairs appear bristle-like but are not quite so stiff as the regular bristles of the Diptera.

In the Empididae the bristly hairs are not so prominent. The abdomen generally terminates into two, round, conical tubercles with a bristly hair at the apex of each. These tubercles are of the same texture as that of the abdomen of the pupa. The pupa of some of the Empididae do not have these tubercles, being simply rounded at the apex.

***Mythicomyia californica* new species.**

This species runs to *Mythicomyia rileyi* in Cresson's table⁶ of females.

¹Williston, S. W., Manual of North American Diptera, 2d Edition, 1896, p. 73.

²Williston, S. W., Manual of North American Diptera, 3d Edition, 1908, p. 218.

³Melander, A. L., Transactions American Entomological Society, vol. 28, 1902, p. 336.

⁴Coquillett, D. W., Entomological News, vol. 4, 1894, p. 209.

⁵Cresson, E. T., Jr., Entomological News, vol. 26, 1915, p. 448.

⁶Cresson, E. T., Jr., Entomological News, vol. 26, 1915, p. 451.

Female.—Black and yellow species. Vertex and occiput black, shining. Front, face and oral margin lemon-yellow, subshining. Antennae dull black, third joint wider at base, about two and one-half times longer than width at base; style about half as long as third antennal joint. Thorax subshining on dorsum, black with two very narrow, pale yellow lines, broader at each end; humeri, pleurae, scutellum and halteres pale yellow. Abdomen pale yellow with a lateral and mid-dorsal row of dull black, triangular spots. Legs pale yellow, with the tips of the tibiae, apical third of the metatarsi and the four succeeding joints brownish-black. Wings with second longitudinal vein sinuous; anal cell closed in the border of the wing.

Length, 1.5 mm.

Described from one specimen taken at Mt. Lowe, California, July 3, 1917, J. M. Aldrich, collector.

Type.—Cat. No. 26539, U. S. N. M.

***Mythicomyia minutum*, new species.**

Runs to *Mythicomyia pictipes* in the table of females.

Female.—Black and yellow species. Vertex, occiput, front and face dull black. Antennae black; third joint one and one-half times longer than wide; style nearly as long as third joint, with the apex pointed and oblique on one side. Thorax dull black on dorsum with a broad central stripe reaching to the neck; humeri pale yellow; this yellow extends to the suture; postalar callosity and a small area in front along the pleural-suture is pale yellow but this yellow does not reach forward to the suture. Scutellum brown; black in the central basal area. Halteres lemon-yellow, basal part of stems with brownish infuscation. Abdomen nearly as wide as long, first three segments and basal half of fourth segment brownish-black, remaining apical portion of abdomen pale yellow. Femora mostly brownish-black; coxae with brownish infuscation; trochanters, apices of femora, entire tibiae and metatarsi pale yellow; four remaining joints of all tarsi brownish-black. Wings with second longitudinal vein slightly sinuous and oblique; anal cell wide open.

Length, 1.5 mm.

Described from one specimen, Las Cruces, New Mexico, June 14, 1917, J. M. Aldrich, collector.

Type.—Cat. No. 26540, U. S. N. M.

PACHYNERES, new genus.

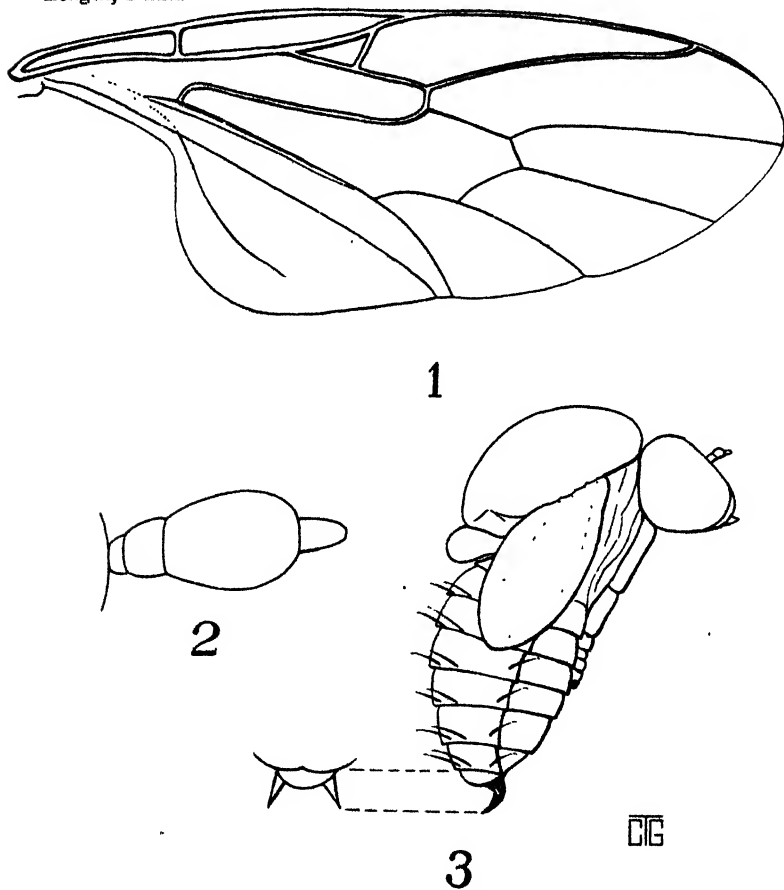
Resembles *Mythicomyia* but differs mainly in having the discal and second basal cell confluent; second vein short and straight. Antennae short and very broad; third joint only slightly longer than wide; style thimble-shaped, length about one and one-half times the diameter.

***Pachyneres crassicornis*, new species.**

Female.—Shining black species with short black pubescence. Knobs of halteres, humeri, postalar callosities, a narrow dorso-pleural line pale lemon-yellow. Under surface of the knobs of the halteres and stems brownish-black. For further details of antennae see drawing (Fig. 2). Abdomen about one and one-half times as long as wide. The costal vein to a little beyond the tip of the

third, the first, second and third longitudinal veins entirely and the fourth vein to and including the small cross-vein, are quite heavy and dark brown in color; the other veins are thin and very pale yellow in color; anal cell wide open (Fig. 1).

Length, 2 mm.



1. Wing of *Pachyneres crassicornis* Greene. 2. Antenna. 3. Pupa, lateral view.

Type locality.—Washington, District of Columbia.

Collected in decaying tree of *Quercus velutina* in the grounds of the Soldiers Home, April 15, 1923, and reared by Miss E. E. Myers. Adult emerged April 20, 1923. Two females from Aweme, Manitoba, June 2, 1918, N. Criddle, Collector, labeled "Collected on strawberry blossoms." One specimen from Castle Rock, Pa., May 26, 1923, E. T. Cresson, Jr., collector. (Returned to the Academy of Natural Sciences, Philadelphia.)

Type.—Cat. No. 26538, U. S. N. M.

Pupa.—Pale yellow. Head distinct; antennal capsules prominent, with two distinct joints and a thimble-like projection at the apex; tip of proboscis projecting slightly. Thorax broad and humped prominently; wing pads distinct; scutellum distinct; leg capsules showing two long joints and four tarsal joints, the tip being annulated. Abdomen showing eight segments, the first and last rather small; segments two to seven showing two longitudinal double rows of brownish, bristle-like hairs slightly bent at their apex; segments four to seven each have a single bristle-like hair near the outer apical corner. At the apex of the abdomen, towards the ventral surface, are two prominent, brown, chitinous prongs or hooks, widely separated, turned upwards. For details see drawing (Fig. 3).

Length, 2 mm.

One specimen found in frass in a decaying tree of *Quercus velutina*.

A NEW GENUS AND SPECIES OF TRYPETIDAE INFESTING ASPARAGUS IN SOUTH AFRICA. (DIPTERA).

By D. W. COQUILLETT.

ZACERATA, new genus.

Distinguished by the unusually long antennae, which are almost twice as long as the face, slender and linear, the first joint wider than long, the second slightly longer than the third, arista bare, basal. Head about twice as high as long, face convex, slightly projecting forward at the oral margin, eyes oblong, about five times as high as width of cheek, three pairs of orbital bristles, the lowest pair on a line with insertion of antennae. Wings rather narrow, stigmal cell unusually short, second vein very sinuous, the third less so, discal cell greatly narrowed on its basal half, small crossvein at a point near two-thirds the length of the discal cell, lower apical angle of the anal cell rectangular, first vein and base of the third bristly, last sections of third and fourth veins subparallel.

Type.—The following species:

Zacerata asparagi, new species.

Black, the second antennal joint, arista and tarsi, yellow. Face polished, the sides thinly gray pruinose, front subopaque, seven spots in two transverse rows near the middle and a row of five along each eye, gray pruinose. Body somewhat polished, mesonotum marked with many gray pruinose lines, pleura thinly gray pruinose, the mesopleura covered with black dots except on its front edge, scutellum not distinctly swollen, bearing four bristles, abdomen thickly covered with black dots; ovipositor flattened, the basal joint nearly as long as the last two abdominal segments. Wings hyaline, the base to tip of first vein and from costa to fourth vein brown, basal half of second basal cell and whole of anal, brown; a large brown, three-pronged spot on outer half of wing, extending along the costa from slightly before the small crossvein to beyond apex of the fourth vein, sending a brown branch over the hind crossvein and another over the small crossvein crossing the discal cell and almost reaching the middle of the third posterior cell; the two brown regions are narrowly connected along the fourth vein.

Length 3.5 to 5 mm.

Two males and four females.

Explanatory Note.

The foregoing paper was drawn up by Mr. Coquillett in 1909, two years before his death, and sent to Cape Town, but was laid away unpublished under the impression that Mr. Coquillett intended to publish it in the United States. After some years I found the named specimens in the U. S. National Museum collection, but could not find where the description had been published. Inasmuch as the only labels on the specimens read "Worcester, C. G. H., Jan. 08." I formed the theory that the late C. Gordon Hewitt had bred the material. Writing to his successor, Mr. Gibson, in Ottawa, it was found that no record of the matter exists there. I then sent two specimens to Mr. J. E. Collin, the well-known dipterist of Newmarket, England. He replied that the species is certainly not British, and suggested that the initials on the label might mean "Cape of Good Hope." A few months later Mr. C. P. Lounsbury, of Pretoria, visited Washington, and I asked him if he remembered the species. He did, and on his return in passing through Cape Town looked it up and sent back the above manuscript.

Mr. Lounsbury writes, "The asparagus roots from which the plants were grown were imported, but it seems to me likely that the fly itself is South African."

Of the six original specimens, the type male and allotype female (U. S. N. M. No. 26695) are in the National Museum; one male and female, paratypes, were sent to Mr. Collin; and two female paratypes are returned to Mr. Lounsbury for deposit in the proper museum in South Africa.

Mr. Collin sent his specimens to Professor Mario Bezzi, of Turin, Italy, who reported that he had not seen the species among the large collections of African Trypetidae that he has worked up. Mr. Collin has kindly turned over the following additional descriptive notes on the characters, which cover details used in recent work on the family.—*J. M. Aldrich.*

Notes by J. E. Collin.

CHAETOTAXY. *Head.*—Three pairs of widely-spaced incurved lower orbital bristles; two pairs of recurved upper orbitals, the front pair almost in line with front ocellars and slightly stronger than hind pair. Outer vertical bristle placed just behind upper corner of eye, some little distance from inner vertical, which is one-fifth of width of frons from corner of eye. Ocellar bristles about as long as front upper orbital; postvertical pair close together, short, upcurved and parallel. Bristles of occipital row black, very small and inconspicuous. No strong genal bristle.

Thorax.—Apparently only one pair of dorsocentral bristles (about in transverse line with front postalar bristle); prescutellars present, nearly as large as dorsocentrals. A humeral, a presutural, 2 notopleural, a supra-alar, 2 postalar, and 4 scutellar bristles. Disc of scutellum with a few short hairs. Scapular

bristles short, only one pair, wide apart. Prothoracic sternum with pale marginal hairs, and sclerite in front of prothoracic stigma with a row of whitish hairs in front. No true prothoracic bristle. Mesopleura with numerous short, dark bristles, longer and stronger on hind margin, especially towards upper corner. Pteropleura with a strong bristle on upper margin and 5-6 small bristles below it. One strong posterior sternopleural bristle.

Wing.—Subcostal vein bristly on upper surface from humeral crossvein to tip; cubital vein the same from radio-cubital node to about half way to crossvein, with an additional isolated bristle just above the crossvein. No bristles on under side of veins.

COLOR, ETC.—The ground color of frons and cheeks is a light mahogany, but the face, jowls, and occiput are darker. The 5-6 grey spots on frons "along each eye" are fairly conspicuous, but Coquillett's "two transverse rows of spots" are really represented by an upper row of four irregular grey spots or patches—one just in front of each front upper orbital bristle and one on each side of front ocellus—and a lower row nearer front of frons of three more or less confluent spots which may also be connected on a narrow median line with the middle ones of upper row. Further there are three small grey patches on vertical ridge.

The manner in which the thorax and abdomen are reticulated or mottled with dusted grey reminds one of similar markings in *Platystoma seminationis*.

NEW TARSONEMID MITES (ORDER ACARINA, FAMILY TARSONEMIDAE).

By H. F. EWING, *U. S. Bureau of Entomology*.

In the following paper a new genus and three new species of Tarsenemid mites are described. The new genus, *Locustacarus*, is created for the reception of a new species taken from the tracheae of certain grasshoppers in the State of Kansas several years ago, and studied by Dr. P. S. Welch and L. P. Wehrle. The results of these studies were presented in a joint paper by these two authors at the 1923 meeting of the Entomological Society of America.

***Tarsonemus phyllophorus*, new species.**

Female.—Very long, with subcircular capitulum. Pseudostigmatic organs capitate, head spherical and in diameter equal to the length of the thread-like pedicel; pseudostigmata circular, equal to heads of pseudostigmatic organs in diameter. Slightly above and behind each pseudostigmata is situated a long seta which exceeds in length the width of the cephalothorax.

Abdomen truncate in front and broadly rounded behind, with sides which are almost parallel. Dorsally the abdomen is divided into three subequal areas in front of the insertion of the third legs by two transverse sutures, and behind the third legs into three very unequal areas by two transverse sutures. Dorsally, abdomen nude except for a pair of minute setae situated sublaterally about midway between the second and third pairs of legs. Three pairs of minute setae around the curve of the posterior margin.

Legs rather short; first pair reaching slightly beyond the tip of capitulum; second pair slightly shorter than the first; third pair extending for a little over

half their length beyond the margin of the body; fourth pair slightly shorter than the third. Dorsal terminal seta of tarsus IV flagelliform, equal to the leg in length; ventral terminal seta of tarsus IV straight, rigid, spine-like, half as long again as the tarsus.

Length, 0.20 mm.; width, 0.08 mm.

Male.—Shorter than the female but much broader. Capitulum circular, about one-half as long as the cephalothorax.

Cephalothorax fully as broad as long; above with two pairs of conspicuous setae, the front pair is almost twice as long as the more rigid posterior pair, and is fully equal to the cephalothorax in length.

Abdomen as broad as long and broadest at the region of the third pair of legs; genital papilla considerably broader than the capitulum and with posterior part expanded and bearing a pair of setae.

Legs stout; first pair slightly surpassing the tip of papilla; second pair slightly larger than the first; third pair much the largest and longest of all; last pair reduced. The third pair of legs is dorsolateral in position; coxa about twice as long as broad; femur constricted near the base; patella not as broad as femur, about one and a half times as long as broad; tibia slightly longer than patella; tarsus about as long as tibia, very broad at its base. Femur IV about two-thirds as long as leg IV, on its outer margin, incurved, and on its inner side expanded into a large hyaline leaf-like structure. This expansion of femur IV is oval in shape, broadly rounded throughout, is a third longer than broad, one and a half times as broad as the femur is at its base, and bears above a seta near its base distally which extends fully half way to free edge of the expansion. Patella IV minute, over twice as broad as long and shorter than tibia IV. Tarsus IV reduced to a small chitinous knob.

Length, 0.19 mm.; width, 0.13 mm.

Type locality.—Florida.

Type.—Cat. No. 23777, U. S. N. M.

Described from numerous specimens of both sexes taken from *Phyllostachys bambusoides*, Brooksville, Florida, by H. L. Sanford and from many specimens from same host and place taken by W. B. Wood. Specimens also taken from *Phyllostachys* sp., Yokohama, Japan, November 27, 1922. This species is related to *Tarsonemus spirifex* Marshall, but is easily distinguished from *spirifex* in the characters of the posterior legs of the male. In *spirifex* the base of the femur is about as broad as the leaf-like expansion while in *phyllophorus* it is but little over half as wide; in *spirifex* the part of the femur extending beyond the leaf-like expansion constitutes about half the length of the segment, in *phyllophorus* it constitutes about a fifth of the segment. Also the leaf-like expansion in the two species is shaped differently.

LOCUSTACARUS, new genus.

Three pairs of functional legs present in both sexes. Female without pseudostigmatic organs. Palpi reduced, almost rudimentary. Chelicerae needle-like, curved spirally at base. Tarsi, each with a stout pair of claws and a large,

pedicellate pulvillus. Oviparous; adults hatching directly from eggs. Gravid females greatly enlarged.

This genus is related to *Eutarsopolipus* Berlese, the type species of which was taken at the bases of the wings of a beetle. It differs from Berlese's genus in that the female is provided with a dorsal plate to abdomen and the male is without the posterior forceps-like appendages (legs?).

***Locustacarus trachealis*, new species.**

Female.—When nongravid, minute, with a broad, short body; when gravid, body distended at its middle until several times its former size. Capitulum as broad as long and about two-thirds as long as cephalothorax. Chelicerae when thrust out seem to be about as long as cephalothorax. Palpi greatly reduced, fused with beak and each terminated by two spine-like tubercles.

Cephalothorax as broad as long and provided above with three pairs of large setae; one pair situated laterally at the base of capitulum, one pair situated above the bases of first legs and one pair situated above the bases of second legs. Sternum formed by the junction of first and second epimera and extending backward along the median line to about the middle of the body in non-gravid specimens and ending in a transverse bar, or T.

Abdomen somewhat larger than cephalothorax and with almost straight posteriorly converging sides. On the abdomen above there is situated at the shoulders a pair of setae which reach scarcely half way to the posterior margin of the body; at each side, somewhat in front of the posterior corner of abdomen, is a long seta, equal to the total length of abdomen; at the tip of abdomen are two enormous setae, situated approximate and usually adhering for their whole length, which are longer than the body of the mite itself.

Legs stout, particularly the first pair. Tarsus of leg I one and a half times as long as broad; tibia broader than long; patella exceedingly short, disc-like femur much the stoutest segment. Last pair of legs more slender than the others and decidedly posterior in position; each tarsus with a long tactile seta.

Length when nongravid, 0.168 mm.; width 0.095 mm.

Male.—Similar to the nongravid female, but body more rounded and lacking the enormous setae at the tip. Posterior setae of cephalothorax stouter than in female and situated dorsally. Legs somewhat more slender than those of female, particularly those of the third pair. Penis dorsal, extending as a spear-like shaft of chitin from about the middle of the back to the tip of capitulum. It is very suggestive of the penis of *Psorergates*.

Length, 0.133 mm.; width, 0.099 mm.

Type locality.—Kansas.

Type.—Cat. No. 23773, U. S. N. M.

An abundance of material (hundreds of individuals) received from Dr. P. S. Welch, of the University of Michigan. This material consists chiefly of females in various states of engorgement, and eggs, but also of several nongravid females and males. It was taken from the tracheae of grasshoppers. Descriptions based chiefly on specimens mounted on type slide.

Tetrapolipus rhynchophori, new species.

Gravid female.—Abdomen enormously swollen making the gravid individual easily visible to the unaided eye. Capitulum about one-half as broad as cephalothorax and slightly longer than broad. Palpi greatly reduced and fused with beak for most of their length, showing no segmentation. Chelicerae rather short, slightly curved needles, almost straight at their bases.

Cephalothorax about as broad as long, narrowed in front where it joins the capitulum; above and posteriorly the cephalothorax bears a broad shield with a broadly and evenly rounded posterior border. No dorsal setae observed on cephalothorax.

Abdomen in gravid specimens pear-shaped with the greatest diameter near its junction with the cephalothorax. Usually only a single fully developed egg present. Dorsally a transverse groove is present slightly behind the middle of abdomen; posterior margin notched at the median line.

Legs short, cone-shaped, almost twice as long as broad at their bases; four evident segments; first segment much the longest, and about as long as the other three put together; second and third segments equal in length; last segment very small. Tarsus I with a single claw; tarsus II with two claws.

Length, 0.435 mm.; width 0.348 mm.

Male.—Short, broad. Capitulum very distinct from cephalothorax, sub-circular. Palpi fused with beak, greatly reduced and showing no segmentation.

Cephalothorax as broad as long and about equal in size to the abdomen. Above only a single pair of dorsal setae present which is situated dorso-laterally near the posterior angles. These setae slightly surpass the cephalothorax in length.

Abdomen as broad as long and indistinctly segmented near the tip. It is without setae dorsally. Penis long, spear-shaped, arising dorsally near the front margin of abdomen and extending forward in a median groove to the apex of capitulum.

Legs about equal. Femur much the largest segment; patella broader than long; tibia longer than patella and as long as broad and in each case bearing a long tactile seta; tarsus somewhat hooked and ending in one or two spurs, each bearing a pair of claws and a large pulvillus.

Length, 0.172 mm.; width, 0.105 mm.

Type locality.—Panama.

Type.—Cat. No. 23774, U. S. N. M.

Description based on a single male and several females, taken from underneath the elytra of a palm weevil, *Rhynchophorus palmarum*, collected at Cocoplum Bocas del Toro, Panama, February 9, 1922, by J. R. Johnston. This weevil was sent to Dr. E. A. Schwarz for determination along with several other species of Coleoptera taken from palms, and H. S. Barber called my attention to the infesting mites. Most of the mites were attached to the dorsal body wall of the abdomen. Several nymphs and many eggs were present. This species is similar to *T. batocerae* Berlese, taken from a Javan longicorn beetle, but has a much shorter cephalothorax and much smaller legs than the Old World species.

NOTES ON THE GENUS BUPRESTIS WITH DESCRIPTION OF ONE NEW SPECIES. (COLEOPTERA, BUPRESTIDAE.)

BY H. E. BURKE, U. S. Bureau of Entomology.

Casey "Studies in the American Buprestidae"¹ and Nicolay and Weiss "A Review of the Genus Buprestis in North America"² give keys for the identification of the adults of the species of this genus which are not altogether reliable. Casey, starting at page 89 and following through to page 105 and page 108, gives *rufipes* Fab. and *gibbsi* Lec. as having males with the anterior tibiae unmodified. As a matter of fact the males of both species have a strong reflexed subapical internal tibial spine. Nicolay and Weiss on pages 81 and 82 give *fasciata* Fab. and *langi* Mann. as having males with the anterior tibiae armed with a reflexed tooth at the apex. All of the males of *langi* examined by the writer have the tibiae unarmed. As *langi* is considered to be a variety of *fasciata* the supposition is that the tibiae of the males of *fasciata* also are unarmed.

On June 13, 1923, near Stirling City, Calif., the writer and Mr. R. D. Hartman took a number of larvae, pupae and recently transformed adults of *langi* from the outer heartwood of an old weather beaten log of douglas fir (*Pseudotsuga taxifolia*). This confirms the observation made on the host of this species by E. C. Van Dyke. Typical six spotted males were taken along with the green females. The habit of pupating and transforming in the spring indicates that *langi* belongs to the true *Buprestis* where it is placed in the keys by most authors. The absence of the tibial spines on the males would separate it from that group, however. The larva, too, is not typical *Buprestis*. It closely resembles the larva of *aurulenta* Linn. which belongs to Casey's subgenus *Cypriacis*.

Casey¹ (pp. 89-111) places *connexa* Horn in the group having males with anterior tibiae unarmed while Nicolay & Weiss² (pp. 81, 82) place it in the group having males with the anterior tibiae armed with a reflexed tooth at the apex. Neither specifically mention having studied any males. The writer has studied the majority of the specimens collected to date and all are females. The two specimens before Horn when he described the species also are noted as being females. Has any one a male of this species?

***Buprestis fremontiae*, new species.**

Adult Holotype, Female.—Medium sized, length 16 mm., width 6 mm., elongate oval, widest about distal third of elytra; head and thorax brownish bronze, elytra fulvous, each elytron marked near the outer margin about the middle with a

¹Proc. Wash. Acad. Sci., v. XI, Apr. 28, 1909.

²Jour. N. Y. Ent. Soc., v. XXVI, June, 1918.

medium sized-subtrapezoidal purple spot, margins of tips rufous; body beneath brownish or purplish bronze, clothed with medium white hair, moderately, evenly punctate.

Head marked by a short frontal ridge, numerous punctures and calli; labrum yellowish; eyes elongate oval, brownish with yellow flecks; antennae bronzy, reaching to middle of thorax, first joint long and clavate, 2d short and clavate, 3-11 joints flattened and triangular.

Prothorax, length $3\frac{1}{2}$ mm., width 5 mm., widest about middle, marked by a broad, shallow median groove, numerous punctures and calli, a small yellowish spot on each side in the anterior margin near the outer angle; sides arcuate; anterior margin sinuate, smooth; posterior margin sinuate, rather obscure; prosternum convex, moderately obtuse, smooth posteriorly, punctate anteriorly, clothed with white hairs; scutellum distinct, coppery.

Elytra slightly wider and three and one-half times as long as the prothorax; humeri moderately prominent; sides slightly diverging for two-thirds of length, then gradually narrowed; apex of each elytron bidentate; surface puncto-striate, without hairs.

Abdomen with first ventral flattened and shallowly concave; last ventral with posterior margin sinuate. Front tibiae slightly arcuate, others straight.

Allotype, Immature Male.—Length 18 mm., width 8 mm., elytra with purple spots similar to female. Fore tibiae slightly arcuate, each with a single reflexed moderately long spine, more like *rufipes* than *gibbsi* and *viridisuturalis*.

Larva.—Thorax moderately broad, flattened, sub trapezoidal, three segmented; abdomen of medium width, flattened, ten segmented; texture rough, dull; whitish; pubescence sparse.

Head, mostly retracted into prothorax, medium sub-orbicular, not strongly chitinized, mouthparts darker; front well developed, darker anteriorly, pits large, shallow, each bearing a pair of large bristles, anterior frontal margin sinuate, anterior epistomal margin arcuate, lateral excavations of epistoma broad, with a prominent tooth near inner angle; clypeus amber, quadrangular, apparently twice as wide as long; labrum amber, subquadrangular, about twice as wide as long, anterior margin sinuate, bearing a dense row of light colored bristles; antennae in deep fossae, apparently three jointed, basal joint large, sub-conical, 2d nearly as long, sub-cylindrical, outer distal margin fringed with bristles, 3d very small, telescoped into tip of 2d, bearing a long, lateral sub-distal light bristle; mandibles broad, well developed, piceous, three toothed, with bases well developed, piceous; sub-quadrate and rugose; genae sub-quadrate, darker anteriorly; gula broad, dark brown; mentum and submentum fused, trapezoidal, light; labium sub-quadrate, rounded anteriorly, fleshy, rugose, anterior margin emarginate and fringed with light bristles; maxillae prominent, cardines large, fleshy, irregular, much broader at base, stipes slightly clavate, shorter than cardo, darker, palpus about same length as stipes, two jointed, 1st sub-cylindrical, bearing a long light sub-distal bristle, 2d much smaller, short, sub-cylindrical, lacinia about same length as first joint of palpus, flattened, slightly declivent, inner margin setose.

Prothorax medium, sub-pentagonal; plates well developed, dull; dorsal marked by an inverted U of smooth dark-brown median grooves with base broadest, base and $\frac{3}{4}$ of arms of U surrounded by a reticulated rugose narrow, hood-like

area, angulated at sides, rugosities pointlike, tending to lie in rows on the ridges of the reticulations, few scattered rugosities at anterior margins of dull area within arms of U; ventral plate marked by a median groove which extends from the base for $\frac{3}{4}$ of the distance to the anterior margin, groove widest near middle, fusiform, surrounded at apex by a broad reticulated rugose area which narrows toward base where it widens again, the whole forming a vase-like marking.

Mesothorax distinctly narrower than prothorax, short, divided into two ventrally by a deep transverse groove, large crescentic spiracle on each side in the anterior portion.

Metathorax slightly narrower than the mesothorax, about twice as long.

First abdominal segment thoracic in appearance, considerably narrower than metathorax, about same length, widest anteriorly, bearing a large fleshy median lobe dorsally and a large and two small ones ventrally, without distinct lateral folds, medium sized spiracle on each side near anterior margin; segments 2-8 flattened, longer and slightly wider than first, with distinct dorso- and ventro- lateral folds, spiracles on each side dorsad of dorso-lateral fold; 9th slightly shorter and distinctly narrower than preceding, widest anteriorly, with lateral folds, without spiracles; 10th small, conical, divided posteriorly into two fleshy lobes.

Habitat.—Middle to southern California. Described from one female (Hopk. U. S. No. 16638a), an immature male (No. 16638a), fragments of beetles and a number of larvae (No. 16638a) collected from the wood of fremontia (*Fremontodendron californicum* (Torr.)). The larvae were collected first about six miles west of Northfork, Madera County, by H. E. Burke and R. D. Hartman in May, 1921. The type female was reared from a prepupal larva collected at Northfork in February, 1922, by Hartman. The dead immature male and various sized larvae were taken at the same time. Larvae and fragments of beetles were taken by Burke and Hartman in the Swartout Valley, San Bernardino County, in September, 1923. The larva from which the female was reared pupated May 29 and transformed to the beetle on June 26, 1922, becoming fully colored about July 17th. The larvae mine the sapwood and heartwood of dead stubs on live trees. They may attack the imported *Sterculias* which are much used as shade trees in southern California, *Fremontodendron* being a near relative of *Sterculia*.

Holotype, Allotype and Type Larvae.—Cat. No. 26885, U. S. Nat. Mus.

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A NEW SPECIES OF CONICERA FROM PORTO RICO
(PHORIDAE; DIPTERA).

BY J. R. MALLOCH.

The species described herein was found in the stomach of the Humming-bird *Anthracothorax aurulentus* A. & V., a common species in Porto Rico. In the account of the birds of the island in Bulletin 326, U. S. Department of Agriculture, 1916, page 74, the fly is listed as *Conicera aldrichi*, but the latter is so far as I know confined to the northwestern United States.

The type of the new species will be deposited in the United States National Museum, paratypes being retained in the collection of the Biological Survey.

Conicera latimana, new species.

Male.—Tawny yellow, frons, dorsum of thorax, and all except the narrow apices of abdominal tergites fuscous; hypopygium yellow; apical segment of fore tarsus fuscous; wings clear; halteres yellow.

Upper frontal series of four bristles straight, lower series convex; postantennal pair of bristles very small, divergent, reclinate; third antennal segment bulbous at base and slightly pear-shaped, the apex drawn out into a slender process which is fully as long as the swollen basal part, and like it densely pubescent; palpi slender and not very large, with some short black bristles. Thorax with rather numerous short black hairs on dorsum, and two prescutellar dorsocentrals; scutellum with two strong bristles; mesopleura bare. Abdomen robust, hypopygium large, asymmetrical, one side with a strong curved process. Fore tarsi flattened, basal segment longer than wide, with a slender fringed process at its apex on anterior side; fore tibia with two median anterodorsal bristles; mid tibia with two closely placed dorsal bristles about one-third from base and one anterior preapical bristle; hind tibia with one anterodorsal bristle about one-third from base. First costal division over three times as long as second; costal vein and apex of third thick, costal setulae less than twice as long as diameter of costal vein; fourth vein almost straight, ending in costa in front of apex of wing. Length, 2 mm.

Type and 6 paratypes, Ciales, Porto Rico, July 13, 1913, stomach of *Anthracothorax* (A., Wetmore). U. S. N. M. Cat. No. 26821.

A NEW GENUS AND SPECIES OF MUSCIDAE (DIPTERA).

By J. R. MALLOCH.

The genus included in this paper is an aberrant one and is not clearly referable to any subfamily of Muscidae as at present defined. It finds its closest affinities in the subfamily Phaoniinae to which it is tentatively referred.

The type is in the United States National Museum collection.

COENOSOPSIA, new genus.

Generic characters: Frons of male one-third of the head width; ocelli distinct, triangle glossy, ocellar bristles long and strong, each orbit with two backwardly directed and one strong forwardly directed supraorbital, and two or three incurved infraorbital bristles; interfrontalia with a strong pair of cruciate bristles; eyes bare, about twice as high as long; parafacial not visible from side; cheek not as high as width of third antennal segment; arista plumose, the hairs of unequal lengths. Thorax with two pairs of presutural dorsocentrals; prealar short; sternopleurals 1:2, the posterior lower bristle short; hypopleura and pteropleura bare; scutellum short, projecting but little over postnotum, bare below, with four marginal and two short discal bristles, and a few setulose hairs on sides. Legs as in Phaonia R. D. but with a distinct bristle at base of hind metatarsus below. Wing as in Phaonia, but the surface with more evident and sparser hairs and the membrane raised at the base of each hair; sixth vein very short. Lower calypttra hardly protruded.

Genotype.—*Coenosopsia prima*, new species.

Coenosopsia prima, new species.

Male. Black, shining. Head with the anterior part of frons, face, cheeks, antennae, and palpi brownish red. Thorax grayish pruinose, and not noticeably vittate on dorsum. Abdomen yellowish at base and apex of first segment and at apices on each side of other tergites. Legs pitchy black, fore coxae and all trochanters yellowish. Wings hyaline. Calypttrae white. Halteres yellowish.

Third antennal segment about three times as long as second; vibrissae strong; palpi of moderate size. Presutural acrostichals 4-rowed, pre-scutellar pair long; both intra-alars distinct. Abdomen short, almost parallel-sided; hypopygial forceps long and rather slender. Fore tibia with a median posterior bristle; mid tibia with two or three posterior bristles; hind femur with one strong pre-apical anteroventral bristle and one or two short bristles basad of it; hind tibia with one posterodorsal, one anteroventral and two anterodorsal bristles. Inner cross-vein a little proximad of middle of discal cell; last section of fourth vein about equal in length to discal cell; outer cross-vein straight, at its own length from apex of fifth vein.

Length, 2 mm.

Type.—Higuito, San Mateo, Costa Rica (P. Schild). (U. S. Cat. No. 26698.)

NOTES ON THE GENUS DIKRANEURA IN THE UNITED STATES
(HOMOPTERA; EUPTERYGIDAE).

By W. L. McAtee.

The following notes resulting from intermittent study of this genus extend knowledge of the ranges of seven species and add one new species and two new varieties to the list of described forms.

D. maculata Gillette.—Louisiana (C. F. Baker, U. S. N. M.); Church's Id., N. C., Oct. 17, 1918, on hackberry, W. L. McAtee; Chain Bridge, Va., April 23, 1922, J. R. Malloch; Plummers Id., Md., Sept. 14, Oct. 12, 26, 1913, July 19, Sept. 13, 1914, W. L. McAtee.

D. cruentata Gillette.—The principal color vittae of this species vary from scarlet to pale yellow. The holotype (N. Y., No. 2046, U. S. N. M.) lacks markings on the head and thorax, has the vittae on tegmen distinct, and dusky band over cross-veins broad. I group with this those forms having color vittae present on vertex and pronotum, and the angles of the scutellum spotted.

Two other color varieties appear to be worth naming.

***Dikraneura cruentata lavata*, new variety.**

Practically no color markings, sectors near cross-veins and latter in part dark.

Plummers Id., Md., Sept. 14, 1913 (♂ holotype), Windy Run, Va., Oct. 16, 1921, W. L. McAtee.

***Dikraneura cruentata rubricata*, new variety.**

Scutellum entirely red, red markings on tegmen broader and smoky band in front of crossveins more conspicuous than usual in the species.

Virginia near Plummers Id., Md., Sept. 5, 1915, W. L. McAtee (holotype ♀); paratypes Chain Bridge, Va., Oct. 2, 1921, J. R. Malloch.

The foregoing data extend the recorded distribution of the species and we may mention also specimens of the typical variety from Onaga, Kans., F. F. Crevecoeur, and Los Angeles, Calif., D. W. Coquillett.

D. unipuncta Gillette.—The color vittae vary from greenish yellow, through yellow to red in this species. Records extending the published distribution are: Verde Valley, Ariz., Sept. 20, 1922, H. R. Brisley; Graham Mts., Ariz. (Ash Creek, 3200 ft.), July 4, 1914, E. G. Holt; Utica, Miss.; Alabama (C. F. Baker); and Biscayne Bay, Fla. (U. S. N. M. except second record Biol. Survey).

D. abnormis Walsh.—The color markings of this species also vary from red to yellow, and in both cases individuals occur that

lack markings except on tegmina. The variety *rufula* Gillette applies to a type of color variation which it is inexpedient to name in this family.

D. cockerelli Gillette.—The tegminal venation and color of this species is very distinctive; the conspicuous black spot although it lies in an area of the tegmen which would be enclosed between the 3d and 4th sectors if produced, and it would seem could more naturally fall in the 3d apical cell, nevertheless is in the 4th apical cell, the boundary of which seems stretched for the precise purpose of enclosing this spot. The species like most of the family varies in markings from red to yellow. Specimens of both the red and yellow types are at hand from Higley, Ariz., July 18, 1917, and Graham Mts., Ariz. (Ash Creek, 3200 ft.), June 19, July 4, 1914, E. G. Holt.

D. kunzei Gillette.—Numerous specimens from the Graham Mts., Ariz. (Ash Creek, 3200 ft.), May 30, June 15, 21, 25, 1914, E. G. Holt; (Biol. Survey) also from Victoria, Texas, July 29, 1903, and Aug. 15, 1915, the latter labelled as defoliating huisache, collected by J. D. Mitchell (U. S. N. M.). I would not say of these as does the original description that the vertex and scutellum lack distinct markings. The reddish markings on these areas and upon front of pronotum also have a real pattern.

D. carneola Stal.—When the color of tegmina is not solid it is seen to consist essentially of vittae along the sectors. These vary in color from pinkish red to golden, sordid, and paler tones of green. The vertex in this species is much shorter than in the sometimes similarly colored *D. abnormis* Walsh. Numerous specimens from Willard, Utah, October 5, 1914; Promontory, Utah, Oct. 6, 1914; Mouth of Bear River, Utah, Sept. 30, 1914, Ogden, Utah, May 16, 1915, Bountiful, Utah, Aug. 2, 1914; Emigration Canyon, Utah, Aug. 9, 1914; Chiricabua Mts., Ariz., (Barefoot Pass, 8000 feet) July 3, 1919, Alex. Wetmore; Portland, Ore., June 6, 1915, A. K. Fisher, (Biol. Survey).

D. fieberi Loew.—Woodstock, Vt., A. P. Morse (M. C. Z.)

***Dikraneura mera*, new species.**

General color milky white, the eyes brownish and the clavus, tip of ovipositor, and small wedge-shaped spot on each tegmen at end of first sector black; tegmen whitish-hyaline, costal plaques milky. Length: 3 mm. The position of black spots on the tegmina of various species of *Dikraneura* is quite constant and characteristic; the present species has the spots in a different position from any of the previously described species of the United States.

Holotype ♀, Beltsville, Md., June 23, 1918, on *Quercus alba*, W. L. McAtee.

NOTES ON THE STRUCTURE OF BEES.

By T. D. A. COCKERELL, *University of Colorado, Boulder, Colorado.*

I. CERATINIDAE AND XYLOCOPIDAE.

These families are strikingly diverse in their mouth-parts as follows:

- Maxillary comb of closely set long spine-like bristles, on a strongly concave margin; at apical end of comb, next to base of maxillary palpi, a long finger-like lobe; maxillary blade very broad; third joint of labial palpi strictly terminal on second..... XYLOCOPIDAE.
- Maxillary comb of less closely set bristles, on a gently concave long margin; no lobe at apex of comb; maxillary blade elongate, or not very broad (slender and tapering at end in *C. binghami* (Ckll.); third joint of labial palpi attached to side of second near end CERATINIDAE (*Ceratina*)

In *Xylocopa* the second joint of labial palpi is not half the length of first; in *Ceratina* it is considerably over half the length.

Minor differences within the Xylocopidae are such as the following:

- Second joint of labial palpi stout and strictly cylindrical, with few (about 7) bristles on each side *Lestis bombylans* (Fabr.)
- Second joint of labial palpi slender, narrowed in middle *Xylocopa*.
- Second joint of labial palpi with very many bristles, on both sides *X. frontalis nitens* (Lepeletier).
- Second joint of labial palpi with few bristles (7 or 8), on one side only, except a few minute ones at apex on the other side.
- Second joint of maxillary palpi stout, the following ones slender *X. barbata* (Fabr.).
- Second and third joints of maxillary palpi stout, the following ones slender *X. arizonensis* Cress.

Ceratina shows marked differences, thus:

Subgenus CERATINA Latr.

Type *cucurbitina* Rossi. Black species with 5-jointed maxillary palpi; apex of ♂ abdomen truncate; second joint of labial palpi broad and not especially long; last joint of maxillary palpi not or not squarely truncate. An American species differs from the European thus:

- Maxillary palpi fully half length of blade..... *C. arizonensis* Ckll.
- Maxillary palpi considerably less than half length of blade; apical joint of labial palpi slender, very obliquely subtruncate apically *C. cucurbitina* Rossi.

CALLOCERATINA, new subgenus.

Type *Ceratina amabilis* Ckll. Metallic species with 5-jointed maxillary palpi; tongue hardly surpassing labial palpi (far surpassing it in *C. cucurbitina*); second joint of labial palpi very long and slender; apical joint of labial palpi broadly and abruptly truncate at end.

In *C. cucurbitina* and *C. lepida* Smith the second joint of labial palpi is considerably shorter than the first; in *C. cyanea* (Kirby) the second joint is slightly longer than the first. *C. lepida* and *C. cyanea* have 6-jointed maxillary palpi.

Subgenus **CREWELLA** Ckll.

Type *C. titusi* Ckll. Maxillary palpi 6-jointed; mouth-parts greatly elongated; mandibles peculiar. South America.

Subgenus **CERATINIDIA** Ckll. and Porter.

Type designated *C. hieroglyphica* Sm., but specimen studied was *C. lepida* Sm.; they are very closely related. Black species, with 6-jointed maxillary palpi. A distinct and compact subgenus of the Oriental and Palearctic Regions.

Subgenus **PITHITIS** Klug.

Type *smaragdula* Fabr. Bright green species of Oriental and Ethiopian Regions, with 6-jointed maxillary palpi (*C. binghami* Ckll. studied).

Subgenus **ZAODONTOMERUS** Ashmead

Type designated *tejonensis* Cresson. Dark green species with 6-jointed maxillary palpi (although Ashmead said 4-jointed). Widely distributed in both hemispheres.

II. THE MAXILLAE.

The structure of the maxillae, including the palpi, has for many years been regarded as furnishing important characters for classification. There are however additional features which have received scant attention, and some of these may serve our purpose in establishing a better taxonomic system. Maxillae of insects are often characterized by the possession of combs, consisting of specialized bristles, and stiff more or less broadened, inclined to be curved apically. Thus in termites a well-developed comb may be seen on the lacinia. Among the bees, I find two combs, situated in different positions.

(A) *The inner comb*, placed mesad of the palpus, on the basal part of the galea. This is particularly well developed in *Caupolicana yarrowi* Cresson.

(B) *The outer comb*, placed basad of the palpus, on a more or less concave margin of the stipes, or more properly I suppose the united palpifers. This is very highly developed in *Xylocopa*.

The presence of the inner comb distinguishes those bees which are considered less advanced, and the presence of the outer those which are very highly modified. *Hylaeus*, *Meroglossa*, *Palaeorhiza*, *Colletes* and *Caupolicana* all have the inner comb very well developed. The lacinia in these genera is reduced to a small finger-like structure, beset with bristles.

In *Andrena* the inner comb is very well developed, but the lacinia is shorter and stouter, sometimes (*A. mellea* Cresson) broader than long.

Melitta (*M. leporina* Panzer) has no inner comb, and the lacinia is cylindrical. The outer margin of the stipes is hairy all along, the basal half having excessively long hairs. In *Andrena* there is usually much less hair in this situation, but it may be long and abundant, (as in *A. porterae* Ckll. and *A. flavipes* Panzer), though even then not excessively elongated toward the base as in *Melitta*. There is no trace of any apical division of the galea in *Melitta*.

Nomia has a well-developed inner comb, and narrow lacinia.

Sphecodes has no inner comb; it has a primitive feature in the galea, the apical part being distinctly separated, a condition more strongly emphasized in *Vespa*. *Temnosoma* resembles *Sphecodes*, but the maxillary palpi are stouter.

Halictus has no inner comb, and the terminal portion of the galea is separated by a line or suture as in *Sphecodes*. Thus *Halictus* and *Sphecodes* stand apart from *Nomia*, which has no apical division of the galea. In the Colletids there is no transverse division of the galea, but *Colletes* shows a longitudinal division, the separation between the heavily chitinated outer and the hyaline, hairless, inner division being unusually distinct. In the Hylaeids there is also no trace of an apical division. Thus it appears probable, contrary to expectations, that the Halictines have an origin apart from the Andrenines, and not from any Colletid or Hylaeid stem.

In *Augochlora* and *Agapostemon* the division of the galea becomes extremely oblique, but is still quite distinct from the longitudinal line between the darker and lighter parts. In all these Halictine bees the lacinia has disappeared.

In *Protandrena* (*P. mexicanorum* Ckll., *P. bancrofti* Dunning) there is a well-developed inner comb, the lacinia is present and there is no trace of a transverse division of the galea. (The labial palpi of *P. bancrofti* have the first joint much longer and more slender than in *P. mexicanorum*).

Halictoides has no transverse division of galea and no inner comb. The lacinia is well-developed and long, but very delicate, and easily lost in the preparations. (The labrum of *H. tinsleyi* Ckll. is markedly different from *H. campanulae* Ckll.; probably the labra in this group are significant for subgeneric division).

Rhophites (*R. quinquespinosus* Spinola) has the galea long and tapering, of course without transverse division. There is no inner comb. The same may be said of *Panurgus*. In *P. banksianus* (Kirby) the rudimentary lacinia is beset with numerous very long stout dark plumose hairs.

Calliopsis (e. g. *C. coloradensis* Cresson, *C. verbenae* Ckll. and Porter) has a very well developed inner comb, its upper end a moderate (*coloradensis*) or great (*verbenae*) distance basad of the palpi. The galea has of course no transverse division. The rudimentary lacinia bears quite simple bristles. *Spinoliella* (*S. scitula* Cresson) has a well developed inner comb, as in

Calliopsis. *Panurginus* also has a well developed inner comb, and simple bristles on the lacinia.

Perdita has no inner comb. The bristles on the very rudimentary and basad lacinia are sometimes (*P. albipennis* Cresson) briefly plumose.

Has the inner comb been lost in two or more series of Panurgids independently? The Panurgids as a whole must be derived from the Andrenine series, not from the Halictine. If the evolutionary sequence has been Colletoids, Andrenoids, Panurgoids, with the Halictines coming independently from some different, unknown ancestor, it becomes necessary to accept the family Halictidae, which will include *Sphecodes*, but not *Nomia* or *Melitta*.

In none of the bees considered above is there any trace of an outer comb.

Nomada has no inner comb. The margin below the palpi for a considerable distance is gently concave, and beset with small hairs, but these are irregular and do not constitute any sort of comb. In *Triepeolus* there is no inner comb; there is a slightly concave area below the palpus much as in *Nomada*, only it is quite abruptly terminated basad, and here some of the bristles become broadened, and we have the first distinct indication of an outer comb. On the other hand *Pseudomelecta* presents in this region merely a straight edge, without any bristles projecting from the margin. *Crocisa* in this agrees with *Melecta*, except that there are a very few minute hairs. *Phileremus mesillae* Ckll. has the margin gently concave in the style of *Triepeolus* but it is less pronounced, and there are no distinct hairs. *P. americanus* Cresson is nearly identical with *mesillae* in these features. *Phileremulus nanus* Ckll. has the margin below the palpus very faintly evenly concave, with a very few minute hairs. *Neolarra pruinosa* Ashm. has more though irregular hairs. *Oreopasites scituli* Ckll. has this region as in *Phileremulus*.

All these parasitic bees lack the inner comb. They may possibly be derived from bees which had the outer comb, but this can not be shown to be the case, so far as the characters now considered are concerned. *Triepeolus* only has a distinct vestige of an outer comb, but *Phileremus* may be derived from it by degeneration.

The Anthophorid genera, *Anthophora*, *Anthophoroides*, *Emphoropsis*, *Diadesia*, *Centris*, *Melissodes*, *Tetraloniella*, *Tetralonia*, *Melissina*, *Xenoglossa* and *Exomalopsis* all have a very well developed outer comb. This character, together with the absence of the inner comb, indicates their distinctness from the Andrenine series. I find, however, two exceptional forms within the Anthophoridae. The margin on which the comb is set is less concave than usual in the species of *Exomalopsis*, and in *Dasiapis* (*D. ochracea* Ckll.) it is very little concave, and although there is a true comb, there are also many long hairs.

Melitoma (*M. grisella* Ckll. and Porter), which has an extraordinary long and whip-like galea, has no comb. The margin is merely beset with stiff hairs, placed irregularly, and many of them branched. Thus *Melitoma* stands quite apart from the other Anthophoridae.

Xylocopa has an extremely strong outer comb, on a very concave margin. In *Ceratina* the margin is much less concave, but there is a good comb. *Eulaema* has a dense comb of stout curved spiniform bristles on a practically straight base. *Bombus* has a good comb on a gently concave surface (not at all the specialized structures of *Xylocopa*), but the basad end grades into simple hairs. *Psithyrus* has a comb resembling that of *Bombus*. In *Apis* there is a pronounced, rather short concavity, but the comb-like structures exist only on the basad part. Thus the Xylocopidae, Ceratinidae, Bombidae, Euglossidae and Apidae agree with Anthophoridae in possessing an outer comb, as well as lacking an inner one. Such partial exceptions as *Apis*, or complete exceptions like *Melitoma*, indicate secondary specialization.

The Megachilidae still remain to be considered.

Megachile has no inner or outer comb. The margin below the palpus is strongly convex, but presents a certain number of bristles, which in some species are thickened and spiniform. I think these represent the vestiges of an outer comb. The remarkable feature in *Megachile* is the comb often present on the elongate laciniae. In some species (e. g. *M. fidelis* Cress.) the lacinia merely presents some stout bristles at the end. In others there may be also large lateral bristles; but in *M. apicalis* Spinola there is fringe or comb of very long bristle-like hairs. In *Coelioxys* the convex margin below the palpus presents only a very few minute hairs, not at all suggesting a comb. The lacinia may have the hairs practically confined to the end, or may be hairy down the side.

Chalicodoma (*C. caementaria* Meinecke) has merely minute hairs on the convex margin below the palpus. The very stout lacinia has hairs down the side.

Trachusa (*T. serratulae* Panzer) is very remarkable. The galea, palpus and outer face of stipes are excessively bristly, but there is no comb. The basad part of the stipes bears very long finely plumose hairs, recalling the condition common in Anthophoridae.

Anthidium (*A. manicatum* of Europe, and related American species) has a very well-developed outer comb, set on a moderately concave surface. The lower (basad) teeth are very stout, long and curved; they gradually decrease in size apicad, becoming minute at the end of the concavity. The lacinia is broad, and thickly beset with long hairs on the outer edge.

After seeing these, it was astonishing to find the comb totally

absent in other Anthidiines. In *Protanthidium* (*P. steloides* Bingham) the margin below the palpus is nearly straight, and has a good many minute hairs, but no sort of comb. In *Dianthidium* (*perpictum* Ckll., *interruptum* Say, *gilense* Ckll., *parvum* Cresson, *strigatum* Panzer) the margin below the palpus is convex, with a few fine hairs, and no trace of a comb, except that in *D. perpictum* and *D. interruptum* I see a few small scattered spines. The lacinia of *Dianthidium* is just like that of *Anthidium*.

The Osmiines are after the fashion of *Dianthidium*, and have no comb, but in *Osmia brevis* Cresson I find the margin of the stipes with a gentle double curve and all along a series of small dagger-shaped spines, not uniform in size. Other species of *Osmia* show this more or less. *Hoplitis mescalerium* Ckll. has the double curve, but the bristles are not distinctly spiniform. In *H. graceae* Ckll. there are merely small hairs of different sizes on a gently convex margin. *Osmia lignaria* Say has bristles on the margin, and a lacinia just like that of *Anthidium*. *Formicapis* has minute bristles of different sizes on a gently convex margin.

The following key may help to summarize the more essential points:

- Apical segment of galea remaining more or less distinct; lacinia evanescent;
no inner or outer comb HALICTINAE.
- Apical segment of galea entirely united with that before 1.
1. Outer comb absent (in *Triepeolus* apparently vestigial) 2.
- Outer comb present..... ANTHOPHORIDAE (except *Melitoma*),
XYLOCOPIDAE, CERATINIDAE, *Anthidium*. BOMBIDAE, EUGLOSSIDAE,
APIIDAE.
2. Inner comb well developed. HYALIDAE,
COLLETIDAE, ANDRENINAE, *Nomia*, *Protandrena*, *Calliopsis*, *Spinoliella*,
Panurginus.
- Inner comb absent *Melitta*,
Halictoides, *Rhophites*, *Perdita*, *Nomada*, EPEOLINES, MELECTINES,
PHILEREMINES, MEGACHILIDAE (except *Anthidium*), *Melitoma*. (The
Megachilidae and *Melitoma*, and presumably some of the parasitic bees,
outer comb losers; the others without any outer comb ancestry.)

III. PANURGIDAE OR PANURGINAE OF AUTHORS.

Tribe CALLIOPSINI. (Calliopinae Robertson, Psyche, 1922.)

Panurgine bees with well developed inner comb; nearly always with light face-markings, at least in the males. Related to Protandrenini (Protandreninae, Robertson), but with only two cubital cells. For other character see Robertson.

The following key brings out some of the characters within the group:

- Maxillary palpi less than half length of galea; palpus to tip of galea a greater
distance than to base of stipes..... *Verbenapis verbenae* (Ckll. and Porter).
- Maxillary palpi shorter than galea, but considerably over half its length.

End of galea sharply pointed, with no terminal brush of hair; palpus not so far from tip of galea as from base of stipes.....
Hypomacrotera subalpina (Ckll.), and *H. semirufa* (Ckll.)
 (believed to be sexes of one species.)

End of galea rounded, with a strong terminal brush of hairs; palpus about midway between tip of galea and base of stipes.....
Calliopsis coloradensis Cresson.

Maxillary palpi longer than galea; tip of galea with hairs; stipes longer than galea beyond palpus.

Galea broad and short, its inner margin strongly convex; second and third joints of labial palpi short and broad.....
Hypomacrotera callops Ckll. and Porter.

Galea ordinary; second and third joints of labial palpi long and rather slender.....
Calliopsis rhodophilus Ckll.

There appears to have been more or less parallel evolution in *Calliopsis* and *Hypomacrotera*, but the latter genus always has a shorter tongue than *Calliopsis*. *Hypomacrotera subalpina* further differs from *H. callops* in having the second and third joints of labial palpi long and cylindrical.

Spinoliella (*S. scitula* Cresson) falls in the third division above, having the maxillary palpi considerably surpassing end of galea. The tip of galea is hairy, and the inner margin is straight; second and third joints of labial palpi cylindrical. The tongue is not very long, but narrow as in *Calliopsis*.

Pseudopanurgus aethiops (Cresson) is remarkable for the very long (fully 1 mm.) first joint of labial palpi; this joint is not thus elongated in *Panurginus*. *P. aethiops* has the tongue moderate, maxillary palpi not reaching end of galea, end of galea with bristles. In *Panurginus* (*P. boylei* Ckll.) the maxillary palpus does not reach end of galea; the palpus is distinctly nearer tip of galea than base of stipes; the inner comb has ten rather widely spaced teeth or spines.

Tribe PERDITINI—(Perditinae Robertson, l. c)

See Robertson for characters; the inner comb is lost. The maxillary palpus goes well beyond middle of galea, but does not reach its tip. In the subgenus *Cockerellia* (*P. albipennis* Cress., *P. lacteipennis* Swenk and Ckll., *P. albovitata* Ckll.) the maxillary palpus does not nearly reach half-way to the end of the tapering galea. Thus the development parallels that of *Verbenapis*, but the latter has the first joint of labial palpi much more elongated.

Tribe RHOPHITINI, new

Type *Rhophites* Spinola. The inner comb is lost, and there is no trace of the outer comb. The remarkable feature is seen in the labial palpi. The first two joints are broadened, clearly prophetic of the normal condition in the higher bees. In the less specialized genus, *Rhophitoides* Schenck (*R. canus* Eversmann) the labial palpi go a little beyond the tongue; the two broad joints are of about equal length, and only moderately long, the third is much shorter and claviform,

while the fourth is about as long as the third, but very slender. All these joints are in the same straight line. In *Rhophites* (*R. quinquespinosus* Spinola) the first two joints are long and broad, much longer than in *Rhophitoides*; the third is short, but broad like the one before, and continuous with its suture being indistinct; the fourth is slender and cylindrical (slightly claviform) and diverges from the side of the tip of the third as do the small joints of the higher bees from the tip of the second.

In *Rhophitoides* the maxillary palpi extend far beyond the galea, but in *Rhophites* they do not nearly reach its end. Thus the two genera are very distinct, although Friese combines them. Friese remarks that *Rhophites* stands nearest to *Halicitoides* and *Dufourea*; but these genera (in which the maxillary palpi far exceed the galea) have ordinary labial palpi, and form a separate tribe DUFOUREINI (part of Dufoureidae Robertson).

IV. THE GENUS MELITTURGA LATREILLE.

The name is usually spelled *Meliturga*, but Alfken states that Latreille wrote *Melitturga*. I have seen Latreille's type in the Oxford (Hope) Museum. Fourteen species are at present known, ranging from South Africa (*M. capensis* Brauns) to Algeria (*M. rubricata* Morice, *M. algeriensis* Friese), and from western Europe to Persia (*M. caucasica* Morawitz), Transcaspia (*M. pictipes* Morawitz) and the Altai region (*M. clavicornis* Latreille). The apparently discontinuous distribution of *M. pictipes* (Transcaspia and Algeria) was due to a distinct Algerian form (*M. algeriensis*) being taken for *pictipes*.

The position of this genus has long been in doubt. Friese placed it in the Anthophoridae, after *Eucera*. In Ashmead's key it falls between *Melissodes* and *Melitoma*. A study of *M. clavicornis* shows that this is not its true position.

The maxillae have the following characters:

Palpi fairly long, but not nearly reaching end of galea, with six sub-equal joints, the fifth shortest, the first two conspicuously stouter than the others; galea nearly parallel sided, heavily chitinated, the very obtuse end with many strong bristles; margin of stipes basad of palpus straight, with many outstanding hairs, but no trace of a comb; inner comb very well developed, with about fifteen stout red teeth. The tongue is of the long parallel-sided type, but not extremely long; the labial palpi have the first joint longer than the others together, but not flattened, though about the last three-fifths are thickened, and very hairy on one side. The second joint is longer than the last two together; the latter are about equal, and diverge from the straight line of the basal joints.

Both sexes have the clypeus brownish-white; the male has large eyes and a narrow vertex, with the ocelli just above the antennae, and the flagellum is strongly clavate; the labrum is transverse, quadrate, with a longitudinal median groove but no process. The apex of the male abdomen is bispinose. The basal

nervure falls far short of the nervulus; stigma small; three cubital cells, the second receiving first recurrent nervure at its end; marginal cell very broadly obliquely truncate at end.

This bee has nothing to do with the Anthophoridae. It shows a good many points in common with the Neotropical Oxaeinae, which however have no inner or outer comb, and differ conspicuously in other respects. *Melitturga* must stand as the type of a subfamily MELITTURGINAE which will have to be placed for the present under the Panurgidae, a family with uncertain limits. It is to be regarded as a member of the Andrenid-Panurgid series.

A NEW GENUS AND SPECIES OF PIESMIDAE (HEMIP.).¹

By CARL J. DRAKE.

The family Piesmidae, although widely distributed in the holarctic region, has been heretofore represented by only a single described genus, *Piesma* of Lepeletier de Saint-Fargeau et Serville. Through the kindness of Mr. W. L. McAtee the writer has been permitted to study some undetermined Tingitoidea in the National Museum. Among this material there are four specimens of an apparently undescribed genus and species of Piesmidae from Australia.

MCATEELLA, new genus.

Head broad, nearly truncate in front, the jugae and tylus equal or slightly subequal in length. Ocelli present, inconspicuous, placed near the anterior margin of the pronotum. Antenniferous tubercles large, prominent, slightly curved inwardly. Antennae rather long, moderately stout; first and second segments short, the former greatly swollen; third segment slenderest, considerably longer than either the first or second, but a little shorter than the fourth; fourth segment swollen towards the apex, fusiform, longer than the third. Rostral sulcus deep on the head, the bucculae thin, rather high, moderately incurved; rather deep and narrow on the prosternum, shallow and narrow on the mesosternum and disappearing on the metasternum. All coxae placed rather close together. Metasternal orifice present, with a distinct, latero-projecting plate beneath. Pronotum above very coarsely punctate, the median carina not very distinct, the lateral carinae wanting; lateral margins of the pronotum dilated in front. Scutellum exposed, granular, with a small calloused tubercle at the apex. Elytra (macropterous form) coarsely punctate, a little longer than the abdomen with a distinct clavus as well as costal, subcostal, discoidal and sutural areas. Wings present. The brachypterous form is unknown. In the long-winged forms the elytra are entirely coriaceous and the discoidal area is not divided by a longitudinal vein.

¹Contribution from the department of Zoology and Entomology, Iowa State College, Ames, Iowa.

Type of genus, *Mcateella splendida*, new species, in the National Museum. This genus is named in honor of Mr. W. L. McAtee, who has taken a very keen and active interest in the species of Piesmidae.

The genus *Piesma* differs from the genus *Mcateella* in having the jugae distinctly produced and longer than the tylus, the differently formed elytra, and the pronotum with five more or less distinct carinae.

***Mcateella splendida*, new species.**

Antennae rather long, moderately stout, finely and sparsely pilose; first segment greatly swollen, moniliform, very small at the base, about equal to the second in length, the latter only slightly swollen; third segment quite slender, its length about equal to that of the first and second conjoined; fourth longest, more strongly swollen beyond the middle, fusiform. Jugae and tylus equal or slightly subequal in length. Eyes rather prominent, coarsely granulate. Pronotum coarsely punctate, transversely swollen behind the middle, truncate in front, broadly rounded behind; median carina not very distinct. Paranota more broadly expanded in front, projecting a little in front of anterior margin of the pronotum, entirely wanting behind, punctate. Elytra entirely coriaceous (no membranous portion); costal area narrow, short, becoming entirely evanescent before it reaches the end of the basal fourth of the elytra, bipunctate in front; subcostal area broad, composed of eight or nine rows of punctures at its widest part; discoidal area broad, extending a little beyond the middle of the elytra, composed of seven or eight rows of punctures at its widest part. Wings a little longer than the abdomen. Length, 2.65 mm.; width, 1.26 mm.

Color: General color pale stramineous, with brown markings. Each elytron with an oblique transverse brown band, formed by a large spot at the apex of discoidal area and an oblique transverse band in subcostal area. The pronotum, except collum and paranota, scutellum and basal portion of each clavus brown (type). Body beneath pale stramineous, the thorax darker. Rostrum dark brown.

Type, female, Cat. number 25,752 U. S. N. M., from Australia, collected by Koebele. The three *paratypes* bear the same locality and collector labels as the type. The three paratypes show considerable variation in color as follows: (1) pronotum and elytra almost concolorous, the transverse band almost obsolete; (2) pronotum and elytra practically concolorous, the transverse brown band very prominent as in type; (3) seems to be somewhat teneral and slightly variegated with a pinkish tinge. The elytra of the latter show a faint indication of a few extra costate nervures, but these nervures entirely disappear in fully indurated specimens. The type (genoholotype) is more prominently marked with brown than any of the paratypes.

DESCRIPTIONS OF THREE SPECIES OF *TIPHIA* PARASITIC ON
POPILLIA JAPONICA (HYM.).By S. A. ROHWER, *Bureau of Entomology, Washington, D. C.*

For some time the members of the Bureau of Entomology stationed in the Oriental region studying parasites of the Japanese beetle (*Popillia japonica* Newman) have been rearing various species of *Tiphia* from this host. In connection with this work they have collected many other specimens of *Tiphia* and have been able to rear some of them from other Scarabid larvae. Most of this material has been referred to me for study and identification and I have sorted all of the specimens into species and made an effort to identify them with those already described. The field work on these species of *Tiphia* is to be continued, and inasmuch as some of the species are not represented by very many specimens it seems advisable to delay publication of a report on all of the species until some future time. They wish, however, to have names of the three species described below so they may be available for use in publications.

Unfortunately, the earthquake destroyed some of their notes and specimens and it has not been possible to positively associate one of the species with the rearing records. Mr. Clausen, however, feels reasonably certain that the species here described as *autumnalis* is the one which lays its eggs dorsally on the thorax of larva of *Anomala* and occurs in considerable abundance in autumn in Korea.

The life-history observations and notes on the habits of the species are, with the permission of Messrs. C. P. Clausen and J. L. King, included to facilitate the association of species with field notes. The field and laboratory work on these species was done jointly by Clausen and King and will be described in more detail in a paper which they have in preparation.

In describing these species, I have made an effort to indicate where they will fall in available classification of the North American species so as to assist American students to place these introduced forms when they may be recovered in the United States. The descriptions of the species of *Tiphia* described from Japan and the neighboring countries are very brief, and it has been impossible to satisfactorily identify many of these forms. Because of the doubt, it has been deemed advisable to describe all of the species as new, leaving it to the future to determine whether the species are valid.

To facilitate the identification of these three species the following key has been prepared. The characters in brackets are specific characters which will aid in sorting the species from related ones which will agree in the unbracketed characters of the couplet.

Oriental Tiphiae recorded as parasites of Popillia japonica.

1. Inner side of hind basitarsus without a longitudinal groove; propodeal enclosure distinctly narrowing posteriorly and with the median carina wanting or greatly reduced; about 12 mm. long; [anterior and dorsal margin of pronotum separated by a carina; side of pronotum without a groove; second intercubitus strongly curved]; Morioka, Japan and Korea *autumnalis*, new species.
 Inner side of hind basitarsus with a longitudinal groove; propodeal enclosure nearly parallel-sided, the median carina strong, complete; about 10 mm. long 2.
2. Anterior and dorsal margin of the pronotum separated by a carina; [legs black; basal part of pygidium striato-punctate, the apical part very minutely sculptured]; Japan and Korea *popilliaavora*, new species.
 Anterior and dorsal margin of the pronotum not separated by a carina; [second intercubitus distinctly curved; produced median portion of clypeus slightly emarginate apically]; Japan and Korea *vernalis*, new species.

***Tiphia autumnalis*, new species.**

This species seems to be more closely allied to *fuscipennis* Smith than to any other of the species described from either Korea or Japan, but it may be separated from Smith's species by having only two carinae on the propodeum. In Malloch's key (Bull. Illinois State Nat. Hist. Surv., vol. 13, art. 1, 1918, p. 7) it runs to *clypeata* Robertson, but it may readily be separated by the darker wings, the much longer propodeal enclosure and the absence of a median carina on the propodeum.

Female.—Length 12 mm. Clypeus flat, surface with large, close punctures, the anterior margin broadly produced medianly and truncate; the base of mandibles with a number of large punctures; head shining, with large, well separated punctures, the interspaces being much wider on the vertex and occiput; dorsal and anterior surfaces of the pronotum separated by a well defined carina, the anterior face shining, with very few punctures, the dorsal surface also shining but with well defined, rather large punctures which are separated by a distance subequal with the width of the punctures; the posterior margin of the pronotum impunctate; scutum with large, well separated punctures; tegulae broader than long and without a surrounding suture; scutellum more sparsely punctured than the scutum; propodeum shining, when highly magnified the dorsal surface is finely granular; enclosure twice as wide anteriorly as posteriorly, median carina wanting except base; posterior face of propodeum finely and indistinctly punctured except along a median line where there are a few large punctures; mesepisternum polished, the greater part of its surface unipunctate but with large punctures posteriorly and some small punctures in the interspaces; sides of the propodeum dorsally with strong longitudinal striae, ventrally polished except posteriorly where it is finely coriaceous; first abdominal segment without transverse carina, the apical margin without a preapical suture, the anterior and dorsal aspects similarly sculptured; abdomen

polished, the first two segments with a few widely scattered punctures, the third, fourth and fifth with punctures successively closer so that on the fifth they become almost contiguous; pygidium coarsely, longitudinally striatopunctate to the apical fourth, where it is smooth and almost without sculpture; sternites with well separated punctures; apical sternite truncate, the punctures closer posteriorly; hind basitarsus without a longitudinal groove; second intercubitus strongly curved; second recurrent received at the apical fourth. Black; body sparsely clothed with white hairs; wings uniformly dark brown; venation almost black.

Type-locality.—Suigen, Korea.

Paratype-locality.—Morioka, Japan.

Described from 29 females (one type) from the type-locality collected in August, 1923, by C. P. Clausen, and from two females from the paratype locality collected August 20, 1920 by C. P. Clausen and recorded under his number 1385. Mr. Clausen states that this species lays its eggs dorsally on the thorax of grubs of species of *Anomala*, but that it successfully attacks the grub of *Popillia japonica*. The experimental work was based on material from Korea.

Type and paratypes.—Cat. No. 27092, U. S. N. M.

***Tiphia popillavora*, new species.**

The female of this species runs to *robertsoni* in Malloch's key, but it may readily be separated from this species by the presence of a carina separating the anterior and dorsal surfaces of the pronotum. The male runs to *vulgaris* or *inornata* under number 19 in Malloch's key but is smaller, the abdomen is more sparsely punctured and the hair on the sixth ventral segment is erect and whitish.

Female.—Length 10 mm. Clypeus flat, basally with large, close punctures, the anterior margin with a broad, low, median projection which is truncate; base of the mandibles shining, with two or three large, poorly defined punctures; head shining, with large, widely separated punctures, the interspaces greater on the vertex; the area immediately above the antennal fossae with small punctures in interspaces; anterior and posterior faces of the pronotum separated by a distinct transverse carina; the anterior surface of the pronotum with rather large punctures and smaller ones in the interspaces, the dorsal aspect sculptured like the frons except the shining impunctate posterior margin; tegulae broader than long, without a surrounding suture or punctures; scutum and scutellum sculptured like pronotum; dorsal aspect of the propodeum shining but basally indistinctly granular; enclosure parallel-sided, two and one-half times as long as broad, with a complete median carina; posterior face of the propodeum granular, a few irregular wrinkles laterally and without a distinct median carina; abdomen shining, polished; preapical depression on the first tergite shallow and with one series of punctures; punctures widely separated on all tergites and sternites but somewhat larger and a little closer on tergites four and five; pygidium longitudinally striatopunctate to the apical fourth which is shining and

under high magnification finely shagreened; apical margin of the hypopygidium rounded, the surface of the hypopygidium subopaque and the punctures somewhat closer than on the preceding segment; hind basitarsus with a longitudinal groove on the inner side; second intercubitus strongly curved; second recurrent received at apical third. Black; body sparsely clothed with white hair, the hair on the sixth sternite erect, rather sparse; hair on the apical margins of the sternites long and erect; wings uniformly dark brown; venation dark brown; stigma black.

Paratype females vary from 9.5 to 10.5 mm. The infuscation of the wings is slightly variable. Certain of the paratypes, especially those from Korea reared from grubs of *Phyllophaga*, have an oblique groove on the sides of the pronotum. This character seems very well marked in certain specimens but in the series is subject to variation and can hardly be considered even of varietal importance.

Male.—Length 7 mm. Clypeus flat, surface with distinct, close punctures, the apical margin distinctly produced medianly and broadly angulately emarginate; frons sparsely punctured medianly, laterally bipunctate, the larger punctures much more widely separated; carina on the anterior margin of the pronotum sharply defined and followed by a transverse sulcus; pronotum with rather small, widely separated punctures; scutum and scutellum with the punctures slightly larger than those on the pronotum; dorsal aspect of the propodeum granular and with a few transverse aciculations; propodeal enclosure one and one-half times as long as broad, parallel-sided with a complete, distinct median carina; a transverse groove in front of the carina which separates the dorsal and posterior aspects; posterior face of the propodeum finely granular and with a few small punctures; first tergite without a transverse carina, with an indistinct preapical depression; abdomen shining, the first two segments very sparsely punctured, the punctures becoming closer on the succeeding segments; all sternites simple; second intercubitus slightly curved anteriorly, the radial and second cubital cells ending at the same point. Black; body sparsely clothed with glistening white hair; wings pale brownish, darker in the radial area; venation brown; stigma black.

Type-locality.—Morioka, Japan.

Paratype-localities.—Koiwai, Japan; Suigen, Korea.

Described from 12 females (one type) and one male from the type-locality collected August 20, 1920, by C. P. Clausen and recorded under his number 1384; from 13 females from Koiwai collected September 1, 1921, by C. P. Clausen; from five females from Suigen collected September 8, 1923, by K. Sota and recorded under Clausen number 5, accompanied by a note stating that they parasitize grubs of *Popillia japonica*; from seven females from Suigen, Korea, collected August 20, 1923, by C. P. Clausen and recorded under his number 3, accompanied by a note stating "parasitic on the grubs of *Phyllophaga* species"; from five females collected at Suigen, Korea, August 26, 1922, by J. L. King; and from three females and six males reared at Riverton, New Jersey, from material imported from Japan in 1922 and recorded under experiment number 4.

This species lays eggs on the venter of the abdomen between the fifth and sixth segments and is the one commonly referred to by the Bureau field workers as the "Japanese Tiphia."

Type, Allotype and Paratypes.—Cat. No. 27093, U. S. N. M.

***Tiphia vernalis*, new species.**

The female of this species is close to *punctata* Robertson and *robertsoni* Malloch but the wings are darker, the anterior margin of the clypeus is gently emarginate and the posterior face of the propodeum has a median longitudinal carina. The male runs to section 22 in Malloch's key, page 6, and of the species which occur after that it seems to agree better with *conformis* Malloch.

Female.—Length 11 mm. Clypeus slightly convex, produced median portion broad, with a distinct shallow emargination; surface of the clypeus with well separated punctures on the basal two-thirds; base of the mandibles with a few small punctures; head shining, with distinct, well defined punctures which are separated by a distance as great as or greater than the width of the punctures; the area immediately above the antennal fossae with a few small punctures in the interspaces; pronotum without a carina separating the dorsal and anterior aspects; the anterior face with close punctures which in the middle tend to be confluent; dorsal surface of the pronotum with distinct, well separated punctures except on the posterior margin; tegulae broader than long, without punctures and without a surrounding suture; scutum and scutellum with large, widely separated punctures; dorsal aspect of propodeum coriaceous except the smooth posterior lateral portion; median enclosure about twice as long as broad, parallel-sided, with a distinct median carina; a distinct, irregularly foveolate, groove in front of the carina that separates the dorsal and posterior aspects; posterior face of the propodeum coriaceous, more distinctly so below, and with a distinct median carina; mesepisternum with large, well separated punctures except posteriorly, where there are small punctures in the interspaces; sides of the propodeum dorsally with longitudinal striae, ventrally coriaceous and without scattered punctures; hind basitarsus with a longitudinal groove on the inner side; abdomen shining, sparsely punctured, the punctures becoming closer on the apical segments, always separated by a distance greater than the width of the puncture; first tergite without a transverse carina, the preapical groove distinct and with a double row of punctures; pygidium longitudinally striatopunctate to apical fifth which is smooth and apparently without sculpture; hypopygidium truncate apically, rather closely punctured. Black; body sparsely clothed with long white hair which is denser on the apical margins of the sternites and tergites; the hair on the sixth ventral segment slightly recumbent; wings dark brown; venation black; second intercubitus strongly curved.

Male.—Length 7.5 mm. Clypeus flat, the anterior median portion strongly produced, the apical margin with a distinct, angulate emargination; frons shining, with large, distinct punctures which along the eye margins are separated by less than the width of a puncture and in the middle portion are separated by a distance two or three times as great as the diameter of the punctures; vertex punctured like the median portion of the frons; dorsal and anterior surfaces of the pronotum separated by a distinct transverse carina; dorsal aspect

of the pronotum polished, with a few widely separated punctures; tegulae without a surrounding suture or punctures; scutum and scutellum punctured similar to pronotum; dorsal aspect of the propodeum granular, the propodeal enclosure but little longer than wide, very slightly narrowing posteriorly, with a distinct, complete median carina; posterior face of the propodeum coriaceous with a distinct median carina; abdomen polished, with widely separated punctures, the apical segments punctured almost as sparsely as the basal ones. Black; sparsely clothed with white hair; wings hyaline, apically infumated beyond the basal vein; venation dark brown, stigma black; second intercubitus curved so the second cubital cell is longer on the radius; radial cell distinctly exceeding the second cubital cell.

Type-locality.—Suigen, Korea.

Paratype-locality.—Oiso, Japan.

Described from 20 females (one type) and 7 males from the type-locality collected by J. L. King. The type and allotype were collected in coitu and are mounted on the same pin. Fifteen of the females were used in experiments by Mr. King and are recorded under his numbers 10, 11, 12, 13, 18, 19, 24, 27, 30, 31, 32, 33, 40, 41, 42, 43. All of these females oviposited in the larvae of *Popillia japonica* with the exception of that under number 10. Some of the females laid as many as ten eggs, others as few as two. Dates of collection range from April 19 to May 25, the type and allotype having been collected on May 23, 1922. Also described from one female and four males from Oiso, Japan, collected April 21, 1921, by C. P. Clausen and recorded under his number 1597. This species lays the eggs ventrally between the third thoracic and first abdominal segment, the head end being away from the median line.

Type, Allotype and Paratype.—Cat. No. 27094, U. S. N. M.

CHANGE OF A PREOCCUPIED GENERIC NAME.

BY A. N. CAUDELL.

Through the kindness of Prof. C. P. Alexander I have learned that the name *Galloisia*, erected by me on page 53 of the present volume of this journal for a new genus of Notoptera, is preoccupied, having been used in Coleoptera by Hustache in Bull. Mus. Paris, 920, p. 493. I therefore here propose *Galloisiana* for the notopterous genus.

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NEW SPECIES OF PYRALIDAE OF THE SUBFAMILY
NYMPHULINAE FROM TROPICAL AMERICA (LEPID.).

By W. SCHAUS.

This paper is a continuation of several which have appeared in the Proceedings of the Entomological Society of Washington describing new species of Pyralidae in the National Museum. Most of the specimens were collected by Barnes and Schaus, a few have been in the collection for many years and are from unknown or indefinite localities. The paratypes from the Cornell Expedition have been generously presented to the Museum by the University. The Museum is also indebted to Mr. P. Dognin of France for several species new to the collection.

Argyractis maronialis, new species.

Male.—Palpi white, laterally hair brown; throat, pectus, abdomen below and legs white, the fore femora and fore tibiae above hair brown, a black ring on basal joint of fore tarsi; head white; abdomen above with vinaceous buff segmental bands. Fore wings silvery white; base hair brown widest on costa, its outer edge inbent, straight; a similar antemedial patch on costa, its outer edge outbent; a postmedial triangular spot with its apex across discocellular; a subterminal fascia widest on costa, narrowing towards tornus; the antemedial spot followed below in cell by a broad antimony yellow shade to inner margin which is continued below vein 2 to termen, interrupted on inner margin by a slight white postmedial line, and at tornus by an oblique silvery white streak; termen antimony yellow, its inner edge finely fuscous; cilia silvery white. Hind wing white at base; medial antimony yellow fascia from within cell to inner margin, broadly interrupted on submedian fold, containing a few black scales on inner margin; a broad iridescent bar beyond cell and a similar streak below vein 2 to termen; outer area antimony yellow; three velvety black spots on termen partly edged with white and iridescent scales, surmounted by irregular black markings, the line above uppermost spot on a small white space; cilia from apex to vein 2 hair brown at base then white. Fore wing below with costal half hair brown to beyond cell with a whitish line on discocellular, the subterminal fascia as above. Hind wing below cream color the inner margin broadly white, the terminal spots as above.

Expanse, 14 mm.

Habitat.—St. Jean, Maroni River, French Guiana.

Type.—Cat. No. 26918 U. S. N. M.

Can be placed near *C. aequalis* Walker.

***Argyractis cathanalís*, new species.**

Male.—Palpi and head white; thorax whitish buff, abdomen above light drab, the basal segment white, body below white; legs whitish, the fore tibiae streaked with brown, the fore tarsi light cinnamon drab with fuscous spots on first and last joints. Fore wing silvery white; a subbasal and broad antemedial buffy brown spot on costa; a fine similar medial line from costa to below cell, followed by a paler brown shade to the buffy brown postmedial which is outbent and bifurcates from vein 7 to vein 5, the inner branch edging the naples yellow discocellular line which is also dark edged proximally; the yellow discocellular line is continued by a similar fascia to the terminal band above tornus; an erect medial naples yellow line on inner margin emitting a similar line at vein 2 to the fascia from discocellular; a subterminal buffy brown fascia from costa narrowing to a point at vein 3; terminal band naples yellow proximally edged by a fuscous line; a darker silver streak above inner margin at tornus; cilia on inner margin naples yellow, on termen silver white with dark shading at apex. Hind wing silvery white at base and along inner margin; a faint small brownish spot at anal angle; a naples yellow fascia across middle of cell followed by a silver bar extending below cell, the postmedial area naples yellow except a narrow dull white space before the spots; three small black marginal spots edged with iridescent scaling except distally, surmounted by black and suffusing with a terminal black line; cilia beyond spots wood brown tipped with white. Hind wing below with the spots reduced, the scaling silvery instead of iridescent, the terminal line silver.

Expanse, 11 mm.

Habitat.—Guapiles, Costa Rica.

Type.—Cat. No. 26919 U. S. N. M.

Nearest *A. maronialis* Schaus.

***Argyractis maguilalis*, new species.**

Female.—Palpi white on inner side, outwardly drab; head, thorax and abdomen white, the latter with dorsal transverse yellow buff lines. Fore wing white; an elongated fuscous triangular streak on costa beyond base; a broad transverse snuff brown fascia, slightly inbent, partly suffused with ochraceous buff, becoming antimony yellow on inner margin; an antimony yellow streak on discocellular, its brown lines on either side suffusing with a broad snuff brown patch on costa; a medial brown spot at cell with a light buff streak from it touching the end of subterminal at vein 3 and the marginal band at submedian fold; subterminal band snuff brown narrowing to vein 3, its end suffused with antimony yellow, followed by a broad silvery white line to fold; marginal band warm buff with a black line on proximal edge; a light buff spot on inner margin postmedially surmounted by a silver streak to tornus; cilia silvery gray suffused with black at base. Hind wing silvery white on basal half; an antimony yellow fascia across cell to inner margin, followed by a silver streak; postmedial space from costa to below vein 2 light cadmium, slightly white adjoining spots; three small marginal black spots with iridescent scaling between them, suffusing with an interrupted terminal black line and surmounted by some black lines.

Expanse, 13 mm.

Habitat.—St. Jean, French Guiana.

Type.—Cat. No. 26920 U. S. N. M.

***Argyractis bedealis*, new species.**

Female.—Palpi, head and body white, the second segment of abdomen above with subdorsal cinnamon brown spots; legs white. Fore wing white; basal half of costa narrowly bister; a medial inbent sayal brown fascia suffused with yellow on inner margin; a fine parallel interrupted line beyond it, mostly obsolescent, edging the postmedial on costa, as a fine line below cell from which a yellow fascia is outbent suffusing with discocellular, is down bent on upper edge, touches the terminal point of subterminal and the marginal band just above tornus, it then continues as a fine yellow line to inner margin; a postmedial yellow streak along inner margin to a small silver oblique streak near tornus; a postmedial sayal brown spot on costa suffusing with discocellular yellow oblique line which is edged by sayal brown lines; subterminal fascia sayal brown on costa, below it yellow distally edged by a fuscous line; marginal band yellow proximally edged by a fuscous line and with a dark point at apex; cilia silvery gray. Hind wing white; a fine erect brown line above anal angle; a yellow fascia across middle of cell followed by a silver bar before discocellular; outer space yellow downbent to termen below spots, before spots narrowly dull white; three irregular spots, suffusing with short terminal black streaks and surmounted by detached and irregular black markings; iridescent and silvery clusters of scales between the spots and those surmounting them; cilia with a dark line at base below the spots; underside with the spots reduced and very irregular.

Expanse, 12 mm.

Habitat.—Pernambuco, Brazil.

Type.—Cat. No. 26921 U. S. N. M.

***Argyractis aroalis*, new species.**

Female.—Body and wings white; fore tibiae and tarsi streaked with hair brown, abdomen above with faint brownish segmental lines and subdorsal black points on second segment. Fore wing: costa suffused with wood brown to post medial line which is also wood brown, outbent from costa to vein 4 tapering to a point; an inbent antemedial thick wood brown line interrupted below cell; two fine oblique lines at discocellular; a subterminal line similar to postmedial but straighter, broad on costa tapering to a point at vein 2; a cream color line from middle of inner margin to cell, then along vein 2 to the yellow terminal line, the inner edge of which is finely fuscous from above tornus to vein 7; a silver terminal streak along submedian fold; cilia white. Hind wing white; a cream buff patch at end of cell followed by some silvery white scaling and a vertical cream buff line from vein 7 to vein 2; three black terminal spots and a fourth smaller spot separated by metallic amaranth pink scaling and surmounted by small black lunules, also a cream buff line above them from vein 7 to vein 2. Fore wing below with the markings of costal half fainter. Hind wing below entirely white with the terminal spots reduced.

Expanse, 17 mm.

Habitat.—Aroa, Venezuela.

Type.—Cat. No. 26922 U. S. N. M.

Comes nearest *A. aclistalis* Dyar which has the apical area of hind wing suffused with naples yellow.

***Argyrectis aztecalis*, new species.**

Male.—Palpi brown in front, white behind. Head white, collar, thorax and abdomen above light ochraceous buff with fine brownish lines on dorsum and patagia; abdomen below cream color; fore tarsi fuscous with white rings. Fore wing: basal half wood brown, towards inner margin whitish irrorated with brown, followed by a white line which is silvery from subcostal to inner margin, continuing in cell to the discocellular oblique naples yellow bar which is edged on either side with some brown scaling; area beyond below cell and vein 4 naples yellow with a postmedial silvery spot above inner margin and a similar streak from vein 4 near cell to near termen and tornus; costa above discocellular cream color; a wood brown postmedial line, proximally broadly shaded opposite cell somewhat sinuous and retracted at vein 4 to discocellular patch, enclosing some silvery white scaling, also outwardly edged with silvery white from costa to vein 4; a subterminal wood brown line inwardly edged with naples yellow and outwardly by a silvery white line, expanding inwardly at vein 2 and fold; a terminal naples yellow line inwardly edged by a fine fuscous line; cilia silvery. Hind wing costa to beyond middle narrowly, inner margin broadly and cell basally white, otherwise chiefly naples yellow; antemedial brown irrorations below cell and a streak near inner margin; an iridescent bar beyond cell; a terminal white space from vein 7 to below vein 5 with three small black spots, surmounted by a wavy black line; termen with iridescent scaling from vein 7 to below vein 2; cilia white. Hind wing below silvery cream color, the terminal spots reduced to paired streaks.

Expanse, 19 mm.

Habitat.—Jalapa, Mexico.

Type.—Cat. No. 26923 U. S. N. M.

Allied to *A. mignonalis* Dyar.

***Argyrectis esperanzalis*, new species.**

Female.—Palpi wood brown. Head, collar and thorax white, the latter with a few minute dark scales. Abdomen above thickly irrorated with brownish buff scales, partly metallic leaving white segmental lines. Body below silvery white; fore tibiae and tarsi buff in front. Fore wing: base whitish broadly shaded on costa with wood brown, limited by a silvery white line; a medial brown spot on costa; a white streak in cell; the white discocellular line with some brown on either side; postmedial and subterminal lines broad on costa tapering and converging to vein 3, the space between silvery white and a similar white line before the terminal naples yellow line, the latter inwardly edged by a fine fuscous line; outer half of wing below cell and vein 3 naples yellow containing a large silver spot above inner margin and a curved silver line from near base of vein 3 to inner margin near tornus; cilia silvery. Hind wing: costa for two-thirds, base and inner margin broadly shining white; a few dark scales near inner margin, also in end and below end of cell; an iridescent discal bar followed

by naples yellow from vein 8 to vein 2, and again by an iridescent line; terminal area dull white crossed by a naples yellow finely dentate line, with four black spots surrounded by iridescent scales and surmounted by a lunular black line; the second spot from apex really a continuation of the black lines inbent and expanding on termen; cilia white with a brown line near apex.

Expanse, 16 mm.

Habitat.—Esperanza, Costa Rica.

Type.—Cat. No. 26924 U. S. N. M.

Closely allied to *A. triumphalis* Schaus which differs in the terminal spots of hind wing and has the preceding yellow space opaque and closely approaching the spots.

Argyractis valstanalis, new species.

Female.—Palpi avellaneous; head and body white, the abdomen above partly suffused with buff brown bands; body below and legs white, the fore tibiae and tarsi avellaneous, the tarsi with black spots. Fore wing: the costa wood brown; basal half with some buffy brown irrorations to a similar medial line outangled at vein 2; an oblique white discocellular line with brown lines on either side; the medial line followed below vein 2 by a silvery white line and then by a yellowish line forming a semicircle to inner margin near tornus containing silvery scales within and above it; postmedial line remote, snuff brown, outcurved below costa to vein 5, sinuous and faintly retracted near vein 2 towards cell above a yellowish line from discocellular along vein 2, followed by a thick white line from costa to vein 2; subterminal snuff brown on costa and rather broad, below vein 6 yellow proximally followed by a thick silvery white line; marginal band primuline yellow with a fuscous line distally; cilia smoky white with some dark shading. Hind wing silvery white; some light buff shading along inner margin and a small brown subterminal spot before inner margin; a pale yellow spot beyond lower angle of cell to vein 2 followed by a double silver line filled in with pale yellow, the outer line reaching termen; a fine subterminal ochraceous line above the spots; three heart shaped marginal spots followed by silvery golden terminal spots, each spot surmounted by a detached black line, doubly dentate over each spot.

Expanse, 35 mm.

Habitat.—Merida, Venezuela.

Type.—Cat. No. 26925 U. S. N. M.

Near *A. auspicatalis* Schaus.

Argyractis schwarzalis, new species.

Female.—Body above wood brown; back of head, collar medially except in front, and patagia except shoulders white. Body below and legs cream color, the fore tarsi with brown rings. Fore wing: costa broadly suffused with avellaneous; cell and space below chiefly white irrorated with wood brown; a medial wood brown line outcurved on costa and slightly inbent to inner margin; postmedial line narrow but suffusing proximally with costal shade, slightly oblique to vein 2, angled and retracted to discocellular, down and outbent to inner margin postmedially; subterminal cinnamon, very broad on costa, narrowing to

submedian fold, suffused from below vein 4 with naples yellow, inwardly edged by a white line, outwardly by a fine fuscous line and then by silvery white; terminal line naples yellow edged on both sides by a fine fuscous line; a yellow streak below postmedial where retracted to discocellular; a dark silver spot on inner margin at tornus; cilia silvery with a black spot at tornus. Hind wing white at base and on inner margin; some silver scales and a small yellow spot at tornus; a yellow patch beyond cell between veins 6 and 2 followed by an iridescent line which continues below vein 2, is followed by yellow and a second iridescent line; postmedial area above vein 3 naples yellow expanding to apex and containing two white spots, one below vein 5, the other between veins 6 and 7; subterminal space dull white followed by five black spots separated by a fine lunular black line.

Expanse, 22 mm.

Habitat.—Trece Aguas, Alta Vera Paz, Guatemala.

Type.—Cat. No. 26926 U. S. N. M.

Collected by Dr. E. A. Schwarz and Mr. Barber.

***Argyractis chejelalis*, new species.**

Female.—Body above cream color; collar and patagia shaded with cinnamon buff; abdomen with dorsal and subdorsal dark brown irrorations on basal half, the terminal segments cinnamon with white bands posteriorly, body below and legs white, the fore tarsi with pinkish buff and brown spots. Fore wing: base to a medial white vertical line suffused with clay color on costa and in cell, below cell whitish with buff suffusions and some dark irrorations forming an out-curved antemedial shade; medial line followed by a clay color spot on costa, then antimony yellow to the postmedial line; outer half of cell clay color, the discocellular with a white line edged on either side with antimony yellow; postmedial broad on costa terminating in a point at vein 3, its proximal side toothed towards discocellular with white lines on either side; a thick subterminal cinnamon line to near tornus, its outer edge fuscous followed by a white line; terminal line antimony yellow edged on inner side with fuscous; space beyond medial line below cell and vein 3 antimony yellow with a silvery white postmedial spot on inner margin and an oblique silvery white streak from vein 2 to inner margin before tornus; cilia silvery white. Hind wing: base and inner margin from below cell white with some cream color and brown irrorations before the margin; space beyond cell antimony yellow crossed by two iridescent bars between veins 6 and 2, its outer edge finely dentate with a small white spot below vein 6, then followed by white to the spots; three terminal black spots with iridescent scaling chiefly on termen surmounted by a black lunular line expanding to termen between the first and second spots from apex; cilia white with a fuscous line near base from apex to vein 2. Hind wing below with the spots fainter and cut by veins.

Expanse 21 mm.

Habitat.—Chejel, Guatemala.

Type.—Cat. No. 26927 U. S. N. M.

***Argyractis tamanalis*, new species.**

Female.—Palpi white with some fuscous hairs at base; frons white with a medial brown line; collar and thorax olive brown, the patagia edged with white; abdomen above buffy brown, darker shaded dorsally. Body below and legs ochraceous buff. Fore wing: base white limited by a subbasal snuff brown line oblique from costa, then whitish thickly irrorated with snuff brown especially at medial line; medial line white broadly expanding outwardly just below cell; postmedial space snuff brown; discocellular line white, oblique; postmedial line white, outbent from costa to vein 3, curved and retracted to discocellular line, then down and outbent to inner margin, where retracted to cell and downbent the space is filled with antimony yellow and with a similar subterminal spot on inner margin; subterminal line bister, very broad on costa, narrow below vein 5 with some yellowish scaling, followed from below apex to below vein 2 by a white line, then inbent and dark silvery to postmedial; termen antimony yellow proximally edged with fuscous and with terminal black spots; cilia silvery with a basal fuscous line. Hind wing white: some fuscous scaling in and below end of cell, also above anal angle; a postmedial yellowish bar edged with fuscous from vein 6 to below vein 2; apex with a yellow line edged with black; four small black spots on margin broadly edged with iridescent scales, then above and between them with black and a proximal lunular yellow line inwardly edged with fuscous. Wings below with the markings partly visible in transparency, the terminal black spots on hind wing much reduced.

Expanse, 24 mm.

Habitat.—Juntas del Rio Tamana and Rio San Juan, W. Colombia.

Type.—Cat. No. 26928 U. S. N. M.

***Argyractis ulfridalis*, new species.**

Male.—Head and thorax buffy brown; lateral white lines on frons. Fore wing buffy brown with traces of a darker antemedial line; a fine medial white line inbent from costa to inner margin; a yellow bar on discocellular with fuscous lines on either side, suffusing with a yellow streak from below cell to subterminal; postmedial line defined by white on outer side from costa to vein 3; subterminal broad on costa, suffused with yellowish, terminating at vein 3 on the longitudinal streak, outwardly edged by a white line; terminal band yellow suffusing at tornus with a similar streak on inner margin and above this latter an interrupted fine silvery streak; cilia silvery. Hind wing white, the inner margin broadly silky gray with some darker scaling above anal angle; a golden brownish spot at middle and below middle of cell; a brownish spot in end of cell followed by a short white bar; a broad and irregular postmedial fascia reaching the lowest marginal spot; three large black terminal spots, the lowest spot completely surrounded with iridescent scaling, the other two only laterally and terminally; the middle spot surmounted by two coalescing smaller black spots, the first and third by a curved black line; cilia grayish white with some fuscous mottling at apex. Underneath the spots are black on a white ground.

Expanse, 11 mm.

Habitat.—Dominica, West Indies.

Type.—Cat. No. 26929 U. S. N. M.

Argyractis rinconadalla, new species.

Female.—Palpi ochraceous laterally streaked with wood brown; frons wood brown, some white on vertex; collar and thorax white, the former in front and shoulders bone brown; abdomen dorsally clay color, the base white and some bone brown scaling on second segment. Body below white; fore and mid legs buff, the fore tarsi with fuscous spot, the hind legs white. Fore wing white; basal half of costa bister followed by a yellow ocher streak to postmedial line which is outbent, narrow, suffusing at vein 3 with the subterminal which is broader, inbent along vein 2 and 3 to a transverse medial band which is inbent below cell, all these markings bister; a faint whitish line between the postmedial and subterminal above vein 3 becoming yellow ocher on costa; a silvery white band from costa near apex following the subterminal; apex bister, below it a yellow ocher band, finely edged on either side with fuscous, shortly inbent at tornus on inner margin, where it is preceded by a short vertical bister line; cilia silvery white. Hind wing white; a broad antemedial bister fascia; a fine brown line across cell to below origin of vein 2; termen dark silvery gray to a yellow patch at anal angle, surmounted by a metallic bronze shade, three small black spots between veins 5 and just above vein 6; apex yellow ocher preceded by two short and fine brown lines. Hind wing below white with the spots replaced by three small clusters of black scales.

Expanse, 23 mm.

Habitat.—Rinconada, Mexico.

Type.—Cat. No. 26930 U. S. N. M.

Somewhat like *A. catenalis* Gueneé.

Argyractis lucianalis, new species.

Female.—Palpi wood brown; frons white suffused with yellow, two brown points in front; collar white with some yellow lateral scaling; thorax wood brown, the patagia with large white spots; abdomen above clay color mottled with bister at base. Body below white; legs white, the fore legs and mid tibiae streaked with cinnamon buff. Fore wing white; basal half of costa bister connected with inner margin by a subbasal bister fascia; a medial outcurved fascia proximally bister, distally snuff brown expanding to end of cell and between veins 2 and 3 to postmedial line; postmedial line bister from costa to vein 3 preceded on costa by a yellow ocher streak and followed by a similar spot and below this latter by a short white line, at discal fold it suffuses with the subterminal line; subterminal broad on costa and rapidly narrowing, bister, near vein 3 suffusing with a yellow ocher streak from cell between veins 3 and 2, followed from costa to vein 3 by a silvery white band; terminal band yellow ocher inwardly edged by a fine black line; a silver streak terminally on fold above a small yellow ocher spot; cilia silvery, the base fuscous. Hind wing white; an antemedial sayal brown fascia from within cell to inner margin; a similar line across cell, downbent and expanding near inner margin above a small yellow spot; a fine bister lunular dentate line from costa near apex to vein 3 near cell; four marginal black spots broadly edged with iridescent scales on termen, and surmounted by a lunular black line; apex yellow ocher. Hind wing: below with black marginal points on veins 3, 5, 6 and one between 5 and 6.

Expanse, 23 mm.

Habitat.—Juan Vinas, Costa Rica.
Type.—Cat. No. 26931 U. S. N. M.
 Nearest *A. rinconadalis* Schaus.

***Argyractis gontranalis*, new species.**

Female.—Head, thorax and abdomen pinkish buff, underneath cream color, the legs pinkish buff. Fore wing white; costa from base to medial line snuff brown followed by a darker brown spot and a warm buff streak to postmedial; base below costa ochraceous buff with subbasal clusters of bister scales below cell and vein 1; medial line fine, snuff brown slightly outcurved, bister irrorations from it to end of cell, below cell to postmedial, and a few below vein I forming a short vertical line; discocellular white bar defined by a pale yellowish line on its outer edge; postmedial line snuff brown outbent to vein 3, almost touching the slightly broader subterminal line which is connected with a yellowish streak from cell between veins 2 and 3; subterminal followed by a silvery band inbent below fold and vein 1; a terminal antimony yellow band inwardly edged from below vein 7 by a fine black line and with a black point at apex; cilia silvery with fuscous spots at base. Hind wing white; an antemedial brownish spot in and below cell; a brownish lunule across cell with a few black scales on it, continuing as a medial snuff brown line downbent and thickly angled postmedially, then upcurved to inner margin near angle; a lunule of fine black scales on discocellular and another above it; an irregular postmedial line of black and bister scales from vein 7 to vein 3 and a few scattered black scales beyond it; four black spots on margin surmounted by a lunular black line and a very faint yellowish tinge; termen iridescent gold expanding slightly between the spots; apex narrowly antimony yellow; cilia white.

Expanse, 24 mm.

Habitat.—Orizaba, Mexico.
Type.—Cat. No. 26932 U. S. N. M.
 Allied to *A. nitens* Schaus.

***Argyractis aengusalis*, new species.**

Male.—Palpi brown with a white line above; head and thorax sepia, the frons white; abdomen above avellaneous, the basal segment white, underneath white. Fore wing white; costal margin sepia suffusing with the postmedial line; base of cell sepia; a short subbasal brownish line not reaching inner margin; an antemedial yellowish fascia expanding at subcostal; an outangled white medial line on costa, outwardly edged by a fuscous line and incurved to inner margin emitting line below cell and a straight line on vein 1 forming an oval postmedial spot with white center; discocellular oblique, white, edged on either side with sepia and followed by a small white spot; postmedial slightly outbent from costa to vein 4; subterminal band yellow buff, almost vertical retracted at vein 2 to discocellular; marginal band yellow buff, separated from postmedial by a white line and suffusing with it at vein 2, both lines partly edged with black along white interspace; an outbent yellow buff line from vein 2 to tornus; cilia white with fuscous shade at base. Hind wing white; an antemedial brownish fascia across cell; a medial yellow buff line, outangled below vein 2, then incurved end-

ing in a brownish spot at anal angle; a semioval postmedial line from below costa to vein 2, crossed by a short line dividing the white center into two spots; four marginal black spots completely surrounded by iridescent scaling and surmounted by a thick black lunular line. Fore wing below almost entirely fuscous except terminally. Hind wing below white; costa fuscous; subterminal semi-oval line present; terminal spots reduced, the scaling around spots silvery.

Expanse, 12 mm.

Habitat.—Rio de Janeiro, Brazil.

Type.—Cat. No. 26933 U. S. N. M.

***Argyractis alemundalis*, new species.**

Female.—Palpi whitish laterally streaked with brown. Abdomen above avellaneous with dark segmental lines, underneath white. Fore wing white suffused with light buff and irrorated with black; a fine subbasal black line; a fine outcurved antemedial yellowish line with clusters of black scales; a medial black line slightly outcurved on costa then vertical to inner margin; postmedial line fine, black, outbent to vein 3, then retracted and upcurved to cell and outbent as a curved line to inner margin near tornus; subterminal buffy brown, broad on costa, its outer edge straight, terminating in a point at vein 3, preceded and followed by clear white, the white inbent below vein 3 to within retracted portion of postmedial; terminal band yellow edged proximally by a fine black line preceded on inner margin by a small dull silver spot and yellowish line; discocellular line white, dark edged, rather indistinct; cilia silvery with black spots at base. Hind wing silky white at base with subbasal fuscous shading and an antemedial blackish shade from within cell to close to inner margin; a quadrate yellow ocher spot medially followed by a fine double black line filled in with silver, the space beyond opaque, cream color irrorated with black; four marginal round black spots followed on termen by smaller spots and lines with iridescent scales between them; a lunular yellow line edges the spots proximally and is then finely edged with black. Wings below largely suffused with fuscous, the spots on hind wing reduced and surmounted only by a fine lunular black line.

Expanse, 13 mm.

Habitat.—Peralta, Costa Rica.

Type.—Cat. No. 26934 U. S. N. M.

Nearest *A. serapionalis* Schaus.

***Argyractis serapionalis*, new species.**

Female.—Head and thorax snuff brown; abdomen buffy brown above with darker segmental lines; abdomen below and legs avellaneous, the fore legs streaked with snuff brown. Fore wing suffused with buffy and cinnamon brown; a fuscous dentate antemedial line; a fine black medial line outcurved below costa and again below submedian fold; postmedial line fine, black out-angled beyond cell, then incurved and minutely dentate on costal half crossing a whitish shade thickly irrorated with cinnamon brown; subterminal broad on costa, bister, below vein 6 sayal brown, at vein 3 retracted to postmedial; terminal band sayal brown edged with black on either side, preceded by a dull silvery line, intersected at fold; cilia dull silvery alternating with black. Hind

wing: base brownish, a large subbasal fuscous patch below cell to near inner margin followed by a white antemedial fascia; a large sayal brown patch in and below end of cell, outwardly edged by a black line, with another sayal brown and black spot below it reaching anal angle; a medial white line beyond discal patch followed by a fuscous line; outer area dull white irrorated with fuscous black; four marginal round black spots, with an interrupted terminal narrow black band and iridescent scales between them, surmounted by a lunular fuscous black line; a yellowish tinge on termen near anal angle; cilia brownish at base then silvery white.

Expanse, 15 mm.

Habitat.—Cayuga, Guatemala.

Type.—Cat. No. 26935 U. S. N. M.

Near *A. plusialis* Herrich-Schaeffer.

***Argyractis psalmoidalis*, new species.**

Female.—Body above benzo brown, the base of abdomen white; body below whitish, the legs light drab. Fore wing benzo brown without any distinct markings on basal two-thirds; a white bar from below costa on outer side of discocellular, outbent to vein 3 and irregularly upcurved to near apex along the terminal band, a short sinuous benzo brown line crossing it at the curve; a marginal olive ocher band proximally edged by a fine black line with some golden points on it from below vein 5, at vein 2 retracted to cell, and between veins 5 and 2 there is a benzo brown fascia preceding it; a short terminal gold streak on submedian fold; cilia white with a black line at base. Hind wing white suffused with drab; inner margin with antemedial and terminal fuscous markings; cell two-thirds the length of wing; a medial fuscous spot in cell, beyond it a dark line downbent and curved to termen near anal angle followed by a white fascia which crosses end of cell and stops near termen below vein 2; outer space between veins 2 and 5 white, thickly irrorated with drab; a fine subterminal dark line from costa to vein 4; four small black marginal spots completely edged with iridescent scales and fine dark drab lines. Fore wing below with the white markings reduced. Hind wing below suffused with drab except a triangular white space from termen with its apex in cell; marginal spots smaller, partly double.

Expanse, 16 mm.

Habitat.—Baracoa, Cuba.

Type.—Cat. No. 26936 U. S. N. M.

Quite unlike any described species.

***Argyractis malcusalis*, new species.**

Female.—Body white, fore wing white; costa wood brown, a darker antemedial spot distally edged with whitish; a medial whitish streak and whitish triangular spot beyond postmedial; space below cell to medial line with some avellaneous irrorations; an inbent medial fascia to inner margin; an inbent white line on discocellular and a white streak beyond it crossed by a fine dentate short black line; postmedial outbent to vein 3 followed by a narrow whitish shade; subterminal band wood brown retracted between veins 2 and 3 to cell, the space below it white with some fuscous irrorations; terminal band warm buff inwardly

edged by a fine black line and preceded by silvery white to vein 2; cilia silvery white with a fine dark line at base. Hind wing white, a few dark scales at anal angle; a silver bar across end of cell with yellow bars on either side; two fine dark brown postmedial lines from costa to vein 3, at costa wavy, with a third line above first marginal spot which becomes thick and extends to termen between the first and second spots; the three spots finely edged with iridescent scales, the second and third surmounted by thick black lunules; cilia white crossed by a dark line near base from apex to vein 2. Hind wing below white, the marginal spots reduced, the postmedial lines broken.

Expanse, 12 mm.

Habitat.—St. Domingo, West Indies.

Type.—Cat. No. 26937 U. S. N. M.

Allied to *A. schistopal* Hampson.

***Argyrectis climacusalis*, new species.**

Female.—Palpi and head wood brown; collar and thorax white; abdomen above drab gray with brown dorsal spots on three basal segments and transverse brown shading on following two segments. Body below and legs whitish, the fore tibiae streaked with wood brown, the fore tarsi fuscous with whitish rings. Fore wing white, the costal margin mostly sepia; an antemedial white bar on costa; a medial white line on costa defined proximally below it to inner margin by a broad sepia shade with some similar irroration on antemedial space, and on distal side by a sepia line to within cell; an oblique white bar on discocellular with sepia lines on either side; postmedial line oblique to vein 3 outwardly defined by a white line; subterminal line sepia, broad on costa narrowing to a point at vein 2, also followed by a white line; terminal line buff yellow with a black line on inner edge and terminal black points; from near middle of inner margin an upcurved yellow fascia to postmedial at vein 2, from it an oblique yellow line to tornus; cilia silvery gray. Hind wing shining white; some fuscous scaling above anal angle and in cell, the latter followed by a discocellular yellow bar, then by iridescent silver scaling and a postmedial yellow line with silver distally, this latter line vertical from vein 6 to near termen below vein 2; three marginal spots and a black point followed by golden iridescent scales on termen, edged above by a silver line surmounted by a lunular dentate black line; a triangular white patch before the spots crossed by a fine sepia line. Hind wing below with the spots reduced to paired streaks with silver scaling on termen.

Expanse, 20 mm.

Habitat.—Tiguri, Carabaya, Peru.

Type.—Cat. No. 26938 U. S. N. M.

***Argyrectis zamoralis*, new species.**

Female.—Palpi avellaneous; head buff white, cilia and thorax bister with some white mottling, the tips of patagia white; abdomen above buff white with segmental bister lines becoming broader towards base, obsolescent terminally. Body below white, the fore tarsi white with brown bands. Fore wing: costa and markings mostly snuff brown; a white spot below costa followed by a subbasal snuff brown line, the antemedial space below cell whitish with some brown

irrorations; medial space snuff brown to inner margin followed by a fine white line on costa and cell, below cell broader; an oblique white line on discocellular, and a white line from it to postmedial at vein 3; postmedial defined by a broad silver white line distally, preceding the subterminal which is partly suffused with tawny olive, outwardly edged by a black line, and at vein 2 is retracted to cell as a cinnamon buff line; marginal band yellowish inwardly edged with black preceded by a silvery white line, outwardly with small golden spots; on postmedial space a semicircular cinnamon buff line edged above with silvery white and containing a similar spot; a cinnamon buff line at tornus with a silver streak above it. Hind wing white; snuff brown scales in cell and on inner margin from base to anal angle; a cinnamon buff line across middle and one across discocellular with iridescent scaling between and beyond; costa apically buffish between veins 7 and 6 with snuff brown mottling and a wavy dark subterminal line across a white patch; three marginal black spots and a black point terminally edged with iridescent scales, proximally with silver, the latter surmounted by a dentate black line. Underneath the spots at veins 3 and 5 are paired with a little silver scaling on termen.

Expanse, 25 mm.

Habitat.—Zamora, Ecuador.

Type.—Cat. No. 26939 U. S. N. M.

Received from Mr. Dognin who has a co-type. Closely allied to *A. climacusalis* Schaus.

***Argyrectis lulesalis*, new species.**

Male.—Head and body white, the abdomen above with cinnamon buff bands; body below and legs white, the first joint of fore tarsi with a black spot. Fore wing pinkish buff, the costa suffused with drab becoming fuscous at base; postmedial space in and below cell to inner margin with dark irrorations; a few ante-medial irrorations almost forming a line; a fuscous medial vertical line; a faint yellowish oblique bar on discocellular; an outbent fuscous postmedial line distally finely edged with white; subterminal triangular space warm buff below vein 7, followed by a white line; terminal band warm buff inwardly edged by a black line, retracted above submedian fold to near cell; a white spot and oblique buff line above inner margin at tornus; cilia white with black shade at base. Hind wings white; a cluster of fuscous scales near inner margin above anal angle; a warm buff bar with a few dark scales across middle of cell, a second bar clear warm buff before end of cell, and a third after discocellular, this last bar downbent to termen and reaching veins 7-8; four terminal iridescent annuli with black centers and laterally edged with black almost meeting on proximal side; subterminal space from vein 2 to costa cream color irrorated with black.

Expanse, 15 mm.

Habitat.—Lules, Tucuman, Argentine Republic.

Type.—Cat. No. 26940 U. S. N. M.

***Argyrectis laurentialis*, new species.**

Female.—Palpi white, head, collar and patagia light ochraceous buff, the thorax bister; abdomen above drab; the second and part of third segment sepia,

a dorsal sepia spot on last segment. Body below and legs white, the fore legs streaked with drab. Fore wing: base sepia followed by an antemedial slightly in-bent white line from subcostal, the latter with an orange spot on its outer edge from below cell to inner margin; some sepia above the spot to subcostal; costa medially light buff; a white medial line blurred towards inner margin; post-medial area sepia limited by a blackish oblique line to vein 5 and a thick white line following it to vein 4, below them an oblique orange band suffusing with the subterminal at vein 4 and with the terminal band on discal fold; sub-terminal broad on costa, proximally orange, distally raw sienna to vein 5, then edged with black to below vein 2; marginal band orange inwardly edged with black preceded by a thick silvery white line; the postmedial sepia space above inner margin limited by an oblique silvery line from near base of vein 3 to a small orange spot on inner margin before tornus; a small silver spot at tornus; cilia dark silvery shaded with black. Hind wing: base and inner margin silvery white; a vertical subbasal sepia line from cell to inner margin; an orange ante-medial line, downbent below cell to termen and expanding at anal angle, preceded close to inner margin by an oval sepia spot containing iridescent scales, followed by an iridescent line which crosses cell before its end; space beyond fuscous; a large round white spot on postmedial area from vein 6 to vein 2; four marginal black spots defined by lateral iridescent scaling suffusing with a terminal black line interrupted by orange points; cilia white suffused with smoky black. Underside with the markings of outer half duller and reduced.

Expanse, 15 mm.

Habitat.—St. Laurent, Maroni River, French Guiana.

Type.—Cat. No. 26941 U. S. N. M.

Allied to *Cataclysta alvealis* Felder which is probably also an *Argyrectis*.

***Argyrectis castusalis*, new species.**

Female.—Palpi, head and thorax hair brown; abdomen above ochraceous tawny with whitish transverse bands irrorated with fuscous except on two basal segments; body below and legs light drab. Fore wing whitish suffused and irrorated with buffy brown forming subbasal and a broad antemedial shade, the latter followed by a fine whitish medial line outwardly dark edged; post-medial space light buff on costa, white in and below cell, limited by a fine dark remote fuscous line outcurved from costa, curved above vein 2 and retracted to discocellular, then downbent to inner margin, outwardly edged by a faint whitish line; subterminal fuscous parallel with postmedial line to vein 3 preceded by a fine whitish line, followed by a slightly wider white line; termen fuscous; cilia grayish with a fuscous line at base. Hind wing whitish irrorated with buffy brown, forming a shade across middle of cell, expanding and downbent on inner margin followed throughout by a clear white shade and a medial brown line outangled below vein 2, and there followed by clear white space to termen; four minute black marginal spots followed by paired silver spots on a fine terminal fuscous line; cilia white crossed by a fuscous line from apex to anal angle. Hind wing below white irrorated with brown except on inner margin; the spots as above.

Expanse, 22 mm.

Habitat.—Jalapa, Mexico.

Type.—Cat. No. 26942 U. S. N. M.

Not like any described species.

***Argyractis tapajosalis*, new species.**

Female.—Body and wings white; collar medially snuff brown; abdomen above with sepia segmental lines only distinct on second and last segment. Fore wing; costa with patches of snuff brown irrorations separated by the ground color and forming in part the commencement of lines; an oblique streak at base of costa; a subbasal curved line to inner margin; an antemedial patch extending slightly below cell; an outcurved medial line followed by irrorations in and beyond cell to postmedial line, interrupted on discocellular by a white lunule edged with hister; postmedial line hister incurved below costa, only reaching vein 3; a subterminal snuff brown line very fine between veins 3 and 2, inangled on submedian fold; a narrow terminal antimony yellow band edged by a fuscous black line proximally; cilia white with a black spot at apex. Hind wing: a fine wavy medial line from discocellular to inner margin at angle; a large postmedial snuff brown patch from vein 7 to vein 2, continuing below vein 2 as a fine line to termen near angle; a subterminal fine line from costa suffusing with the postmedial patch; a narrow terminal yellow line preceded by some silver scaling between veins 7 and 2, with black points on it at veins 3, 5 and 6. Hind wing below white with only the three black points.

Expanse, 20 mm.

Habitat.—Rio Tapajos, Amazon, Brazil.

Type.—Cat. No. 26999 U. S. N. M.

Received from Mr. Dognin.

***Argyractis dodalis*, new species.**

Female.—Palpi, head and thorax white, also two basal segments of abdomen which is otherwise maize yellow with fine fuscous segmental lines; body below silvery white. Fore wing creamy white; the costa cream color; a fuscous basal point, antemedial spot on costa, and a fine fuscous medial line followed by a silver streak below costa; edged below with fuscous which is upcurved to costa; terminal space maize yellow crossed by a thick subterminal silver line partly edged with fuscous; cilia white. Hind wing white at base, then maize yellow, a wavy antemedial fuscous line and a similar irregular postmedial line; a marginal silver line cut by some minute black points; a fine dark terminal line. Wings below whitish, the outer markings visible in transparency, the hind wing with only the black marginal points on veins 2, 3, 5 and 6.

Expanse, 13 mm.

Habitat.—Tumatumari River, British Guiana.

Type.—Cat. No. 27029 U. S. N. M.

***Argyractis gordianalis*, new species.**

Female.—Head cartridge buff; collar and thorax white, the patagia tipped with cartridge buff; abdomen white above, a fuscous band on second segment and light buff bands on following segments; anal hairs fuscous. Fore wing:

costal margin white with tawny markings not extending below cell; inner margin to cell and vein 3 cream color with a small white spot at tornus; a broad sub-basal and antemedial spot; an elongated spot from middle to postmedial line which is oblique to vein 4 edging a white line on discocellular which is also dark edged proximally; a subterminal wedge shaped spot from costa to vein 3; a cream color terminal line partly edged inwardly by some dark scaling; cilia light buff at base with traces of a hair brown line, the tips white. Hind wing: base and inner margin white; a buff yellow antemedial spot in cell and slightly below it, with a dark point at its lower angle, and followed by a silver and golden bar; postmedial space suffused with cream color; two large terminal, irregular black spots, streaked with iridescent scales; cilia cream color, at base adjoining spots hair brown. Fore wing below with costal markings to postmedial suffusing. Hind wing below white, the terminal spots broken by irregular white lines.

Expanse, 9 mm.

Habitat.—Rio Puramaya, Peru; Rio Solimoes, Brazil.

Type.—In Cornell University.

Paratype.—Cat. No. 27105 U. S. N. M.

Collected by the Cornell University Expedition.

***Argyrectis odoalis*, new species.**

Female.—Body and wings white; a dorsal hair brown patch at base of abdomen and faint drab gray lines on following segments, on anal segment cinnamon drab. Fore wing: base of costa benzo brown and a similar antemedial fascia, its outer edge angled on costa, narrower at vein 1, on inner margin maize yellow; medial line very fine, dark, close to antemedial on costa, outangled in cell, on inner margin maize yellow; a postmedial elongated benzo brown spot on costal margin; a warm buff oblique line on discocellular edged by two benzo brown lines; a subterminal fascia, verona brown on costa below vein 6 cinnamon, narrowing to a point at vein 2, a maize yellow band from its end to medial line; terminal band maize yellow from below costa inwardly edged by a black line to vein 2, inbent slightly below 2 and then preceded by a small grayish silver spot; a black point at apex; cilia white, at base dark silvery gray. Hind wing: a broad antemedial warm buff fascia from within cell, interrupted before inner margin where it is reduced to a narrow line, followed in and below cell by silvery scaling, and a fine vertical punctiform dark line; postmedial space mostly cream color becoming white before terminal markings; three small iridescent jasper pink spots edged with short black lines and points, surmounted by a fine broken black line and with terminal yellow points between them; cilia hair brown at base, the tips broadly white. Fore wing below with the costal markings mostly suffusing, the inner margin broadly white. Hind wing below white; the termen silver with black points.

Expanse, 10 mm.

Habitat.—Mouth of Rio Teffé; Rio Solimoes, Brazil.

Type.—In Cornell University.

Paratype.—Cat. No. 27104 U. S. N. M.

Collected by the Cornell University Expedition.

***Argyractis benezetalis*, new species.**

Female.—Body white, the abdomen dorsally with faint ecru transverse lines, the line on second segment mikado brown. Wings white, the markings mostly warm buff. Fore wing: a subbasal black spot on costa emitting a short line into cell; a curved antemedial line suffused with fuscous from costa to vein 1; a parallel medial line suffused with fuscous on costa, followed by a curved line below costa and connected with medial line on inner margin by a small yellow buff shade; postmedial line single on costa, double below subcostal, dark edged, outbent, retracted between veins 2 and 3 to lower angle of cell, then outbent to inner margin before tornus; a subterminal excurved narrow fascia from costa to vein 4; a terminal band inwardly edged by a black line from vein 7 and inbent on vein 2, outwardly edged by a broken black line; cilia light buff. Hind wing: a broken antemedial line; a fine medial line across cell; traces of a postmedial line, retracted at vein 3 to cell and downbent; a subterminal line, partly fuscous; a terminal band inwardly edged by a black line and crossed proximally by a thick silver line, outwardly edged by a black line; cilia whitish. The termen indented below vein 6. Fore wing below with the markings broader, mostly smoky fuscous.

Expanse, 10 mm.

Habitat.—Mouth of Rio Teffé, Rio Solimoes, Brazil.

Type.—In Cornell University.

Paratype.—Cat. No. 27103 U. S. N. M.

Collected by the Cornell University Expedition.

***Argyractis conallalis*, new species.**

Female.—Head and thorax army brown; a white spot laterally on collar; abdomen with first segment ochraceous, second segment army brown, third segment white, the two following segments tawny. Fore wing: base army brown; an antemedial inbent white fascia expanding on inner margin; costa medially grayish; outer half of cell tawny, the space below army brown; a black line on discocellular edged with white; a cuneiform subterminal tawny patch from costa, edged with white, an ochraceous buff line inbent from it at submedian fold; a terminal narrow tawny fascia with a black line on inner edge. Hind wing: base white; a broad medial ochraceous buff fascia crossed by a blackish and iridescent line, its outer edge above vein 5 black expanding to near apex on costa, followed by a white crescent before the spots; two large black terminal spots with iridescent scaling, a white point between them and another white point near the apex which is narrowly ochraceous buff, a light buff point on termen between the spots.

Expanse, 10 mm.

Habitat.—British Guiana.

Type.—Cat. No. 27102 U. S. N. M.

***Nymphula avertinalis*, new species.**

Male.—Palpi, head and body avellaneous, the terminal half of abdomen above slightly darker shaded, the anal tuft partly white. Fore wing avellaneous; a medial white line from subcostal to below vein 1 edged on either

side with cinnamon brown; a fine postmedial fuscous line, slightly outbent from costa, sharply inbent below vein 4; small faint smoky marginal spots on interspaces. Hind wing white on basal half, crossed by an antemedial and a medial avellaneous line; beyond medial line and below vein 5 the postmedial space white above vein 5 and on termen suffused with avellaneous. Hind wing below white irrorated with avellaneous on costa and termen, the lines as above; fuscous marginal points on interspaces.

Expanse, 13 mm.

Habitat.—Baracoa, Cuba.

Type.—Cat. No. 27000 U. S. N. M.

***Cataclysta azadasalis*, new species.**

Male.—Palpi wood brown; body white, the abdomen with fuscous segmental lines; hind tibiae and base of tarsi with long hair brown tufts. Fore wing white; a broad subbasal mikado brown fascia edged with black followed by a faint fuscous line from within cell, and an antemedial fine black line, slightly inbent; medial space with a fine black streak above subcostal, a long ovate line in cell followed by black points, and clusters of black scales above submedian fold and on inner margin; the discocellular defined by a fine dentate black line on its outer edge, inangled at vein 2, outbent and twice lunular inbent along vein 1, ending in isolated black scales at middle of inner margin; a bister postmedial fascia from costa, partly suffused with cinnamon, outbent to inner margin before tornus, followed from below vein 2 by a dark silver spot; subterminal fascia orange buff, wide on costa, narrowing to vein 2, a black line on its outer edge; marginal band orange buff, finely edged with black and with a black spot at apex; the space on either side of subterminal silvery white; cilia black. Hind wing white crossed by irregular black lines; a fuscous patch at base; antemedial line to inner margin; medial line double, below costa united by a black line on median, then obsolescent; two postmedial lines; termen black, its proximal edge irregular, broken partly into spots by iridescent scaling and four small terminal orange buff spots; cilia drab tipped with silvery white. Hind wing below as above, the termen with four small black spots defined by silver.

Expanse, 12 mm.

Habitat.—Rockstone, Essequibo River, British Guiana.

Type.—Cat. No. 27001 U. S. N. M.

Near *C. sumptuosalis* Möschler.

***Cataclysta mangholdalis*, new species.**

Male.—Head buffy brown; collar and thorax silvery gray; abdomen above whitish buff on three basal segments, the following segments light drab with lateral silvery white tufts, the anal segments hair brown with white tufts. Fore wing white with basal and subbasal hair brown suffusions; a fuscous antemedial line, somewhat macular, followed by a fine streak and small fuscous spot in cell and three longitudinal lines between cell and inner margin; discocellular defined by two fuscous lines, the inner line almost vertical to inner margin and outangled on vein 1; a postmedial ochraceous orange and tawny fascia outbent from costa and joined by a bar with a browner subterminal cuneiform fascia between

veins 3 and 4 slightly retracted, angled and oblique to tornus; a terminal ochraceous fascia with a fine black line on inner edge; a silver gray spot above tornus; cilia silvery gray shaded with black at base. Hind wing white; an antemedial black fascia, followed by an outcurved black line on costa and some streaks medially; two postmedial dentate black lines; four terminal black spots with golden points between and partially on them; terminal orange points between them; cilia white mottled with black.

Expanse, 10 mm.

Habitat.—Zaruma, Ecuador.

Type.—Cat. No. 27106 U. S. N. M.

Collected by F. W. Rohwer. Allied to *C. azadasalis* Schaus, which has the line from discocellular outbent and lunular dentate.

***Cataclysta phocosalis*, new species.**

Female.—Head, body and wings white; some yellow scaling on basal segment of abdomen. Fore wing: a buff yellow spot at base; a subbasal buff yellow line inbent from costa where it is conjoined with the similar broader and outcurved antemedial line, the latter having some fuscous scales on its outer edge in cell and above fold; a double buff yellow medial line diverging above cell, and still more so below cell marked with fuscous scaling except on costa and inner margin where the lines are connected by a yellow streak; discocellular buff yellow edged on either side with fuscous followed by a fuscous V shaped mark from subcostal and vein 8 to vein 3; a buff yellow subterminal band edged by fuscous lines from vein 8 to vein 2 there diverging, one branch retracted to discocellular, the other incurved to tornus; a marginal fuscous line; termen narrowly cream white; cilia white. Hind wing: an antemedial, broad medial and narrower subterminal fascia edged with fuscous, the antemedial only outwardly so edged, the postmedial expanding towards inner margin and there largely filled in with white, the postmedial outbent on costa to the terminal buff yellow band; a few terminal black points below apex.

Expanse, 27 mm.

Habitat.—Peru.

Type.—Cat. No. 27030 U. S. N. M.

***Cataclysta anictalis*, new species.**

Male.—Head and body above dresden brown, the patagia silvery white; some white shading on abdomen beyond middle; body below white; legs whitish, the femora light buff. Fore wing: the costal margin, a subbasal broad line; a medial fascia, an outcurved postmedial fascia, a subterminal fascia incurved from apex to near discocellular dresden brown; some ochraceous tawny suffusion on costa above discocellular and on medial and postmedial within cell; base narrowly white; a large antemedial white spot from cell to inner margin; a similar spot, somewhat oblique between medial and postmedial line, these lines suffusing from costa to vein 2; a faint yellowish line on discocellular distally edged with fuscous followed by white points at veins 7 and 5; postmedial followed by white points at fold and on inner margin, and a small triangular

yellow ocher spot beyond them to tornus with a silver line above it at tornus; marginal band yellow ocher proximally edged by a black line from vein 8 to vein 2, preceded by a large triangular white spot; cilia silvery white. Hind wing white; a dresden brown medial fascia from subcostal to inner margin with a yellow ocher round spot on it at subcostal, followed by a broad silver space crossed by an incurved yellow line, upbent at vein 1 to medial fascia; outer area irrorated with coarse black scales; termen yellow ocher with 5 black spots, each containing a few iridescent scales; cilia white. Hind wing below with the spots cut obliquely by iridescent scaling.

Expanse, 11 mm.

Habitat.—Santiago, Cuba.

Type.—Cat. No. 27002 U. S. N. M.

Allied to *C. miralis* Möschler which is much whiter.

***Cataclysta bronachalis*, new species.**

Male.—Palpi and head yellow ocher; thorax bister, patagia white; abdomen above dresden brown, the basal segment yellow ocher. Body below white, the legs mostly white, the fore tarsi buffish with black rings. Fore wing: a black spot on base of costa, the costal margin otherwise mostly suffused with yellow ocher; base below costa ochraceous buff limited by an inbent antemedial line from subcostal where it is also outbent to median fascia close below cell, enclosing an ochraceous buff spot in cell; medial fascia sepia, slightly inbent proximally, curved below subcostal and postmedially to inner margin enclosing a large white almost perfectly round spot; antemedial space also white; a small ochraceous buff spot above discocellular, continuing as a fine line on outer edge of it, then widening and outbent above vein 2 to the similar marginal band finely edged with black; a triangular black spot from below costa with linear apex at vein 2 and marginal band divides the white outer space into two spots, one oval, oblique from beyond cell, the other long and narrow before marginal band; an ochraceous buff spot at tornus with an oblique silver line above it and a small white spot on inner margin before it. Hind wing silky white; a medial brown fascia inwardly edged with sepia, and with an outangled ochraceous buff spot on it at end of cell, followed by silver scaling and a postmedial ochraceous buff broad line connected by a fine line with the spot on medial fascia, and by a broader line with the fascia well below vein 2; the postmedial outwardly edged with silver; sub-terminal space dull white irrorated with black; four small marginal spots with a few iridescent scales on and between them; a terminal ochraceous buff line, slightly expanding between the spots; cilia white. Markings below much reduced.

Expanse, 13 mm.

Habitat.—Cuba or Porto Rico.

Type.—Cat. No. 27004 U. S. N. M.

Belongs to the same group as *C. anicitalis* Schaus.

***Ambia elphegalis*, new species.**

Male.—Palpi white; head white with a medial pale pinkish buff line; neck and front of thorax orange buff, thorax otherwise and collar white; abdomen cream

color with orange buff segmental bands, the basal segment white; traces of black scaling on terminal half. Fore wing: base narrowly ochraceous buff; a sub-basal black line distally white edged followed by a black fascia, distally edged with white from below cell and a fine black line; medial space olive lake with some black scaling on inner margin; a whitish dark edged discocellular line; postmedial line whitish edged with fuscous distally beyond cell, almost vertical from costa inbent below discocellular to vein 2 and faintly outbent to inner margin; terminal space mummy brown crossed by a faintly lunular subterminal white line distally edged with black; cilia whitish gray with a fine light buff line at base followed by a thicker black line. Hind wing cream color, the costa, the postmedial space to vein 4, and termen to below vein 2 mummy brown; a sub-basal ochraceous orange line; a similar antemedial fascia shaded with fuscous in cell and on inner margin; a lunular dark line on discocellular, followed by a whitish spot; postmedial line fuscous to vein 4 then ochraceous orange to inner margin followed by a similar shade from vein 4 to inner margin; a subterminal whitish line from below costa to vein 5, interrupted and continued towards anal angle.

Expanse, 12 mm.

Habitat.—Essequibo River, British Guiana.

Type.—Cat. No. 27006 U. S. N. M.

Near *Ambia flavalis* Warren.

***Ambia marconalis*, new species.**

Male.—Palpi avellaneous; head white; collar and thorax white crossed in front by narrow ochraceous orange bands; abdomen above buckthorn brown with white segmental lines, underneath the white lines broader. Fore wing ochraceous orange separated into fasciae by the white markings, costal edge blackish to medial line, then whitish mostly; base chiefly ochraceous orange with a white point at base, and an antemedial narrow white line joined by a white streak in cell; medial line fine, expanding and inbent below cell, edged with black, followed on costa by a white fovea; a white lunule distally black on discocellular followed by white streaks beyond cell, above vein 6 and above vein 7, latter longer than the streak above vein 6; a postmedial white line curved and slightly inbent between veins 2 and 3, edged with black; a subterminal line expanding somewhat above tornus retracted below vein 2, then broader and downbent to inner margin postmedially; at submedian fold the black edging of lines is connected by a small black bar; the medial ochraceous orange space on inner margin is partly suffused with fuscous; cilia silver shading to black. Hind wing: a narrow subbasal and a broad antemedial white fascia; the medial ochraceous orange fascia partly suffused with black, its outer edge outcurved from costa to below vein 3, again outcurved near inner margin with a white spot on it at discocellular; the subterminal ochraceous orange band retracted on vein 2 to medial fascia; the white line preceding the terminal band constricted at discal fold and vein 2 where it is crossed by a blackish shade.

Expanse, 20 mm.

Habitat.—Yahuar Mayo, Peru.

Type.—Cat. No. 27007 U. S. N. M.

Allied to *A. jonesalis* Schaus which has the postmedial and subterminal white markings of hind wing expanding into spots.

***Ambia asaphalis*, new species.**

Female.—Body wood brown; collar and edges of patagia white, abdomen with vinaceous buff segmental bands; abdomen below white with wood brown segmental bands. Wings white, the markings chiefly yellow ocher finely edged with black. Fore wing: a broad inbent antemedial fascia, its proximal edge rather heavily shaded with black; medial fascia vertical, its proximal edge outcurved to cell, its outer edge formed below cell by the fine black postmedial line which is outcurved and retracted at vein 4 along median, in cell the medial fascia is distally edged by a white discocellular lunule edged with black; the space within postmedial below costa is crossed by a broad yellow ocher streak, and there is similar shading along the postmedial; a broad subterminal fascia curved and inbent at vein 2, its edging suffusing with the postmedial at vein 2 and cell, below vein 2 it is downturned and narrower to inner margin suffusing with the marginal fascia which is shortly inbent on inner margin, and does not extend above vein 8, the white line preceding the marginal fascia is crossed on vein 8 by a yellow ocher streak. Hind wing: a narrow antemedial fascia expanding into a round spot in cell; a medial fascia, its proximal edge almost straight from subcostal, its distal edge formed by a postmedial line retracted at vein 4 to cell enclosing a large white space beyond a black discocellular lunule; subterminal fascia curved and retracted on inner edge to medial fascia below vein 2, then again outcurved; a marginal band.

Expanse, 16 mm.

Habitat.—Tiguri, Carabaya, Peru.

Type.—Cat. No. 27008 U. S. N. M.

Allied to *A. marconalis* Schaus and *A. jonesalis* Schaus.

***Ambia arnoulalis*, new species.**

Male.—Body light pinkish cinnamon, some black irrorations on abdomen. Wings thickly suffused with mikado and snuff brown. Fore wing: a curved subbasal whitish line irrorated with black; a white antemedial line outangled in cell, then inbent and expanding on inner margin; a slight swelling on costal edge medially; a thick white postmedial line inbent from costa to vein 2, inset, broader and outbent to inner margin; a subterminal black line parallel with termen preceded by some fuscous irrorations; termen clear sayal brown; cilia black tipped with white. Hind wing: an antemedial white fascia; a postmedial line, white from costa to vein 5 and on inner margin, the intermediate portion thickly irrorated with black; a faint subterminal black line parallel with termen.

Expanse, 18 mm.

Habitat.—Jalapa, Mexico.

Type.—Cat. No. 27009 U. S. N. M.

Allied to *A. symphorasalis* Schaus, the two species standing by themselves.

***Ambia symphorasalis*, new species.**

Female.—Palpi white; head and body above tawny olive, underneath cinnamon buff with segmental white lines ventrally; legs whitish buff. Fore wing tawny olive, the markings white; a line from subcostal near middle strongly inbent and expanding to inner margin; a streak from discocellular to subterminal line which is deeply outcurved and inbent to inner margin postmedially, finely edged with hair brown scales, preceded from vein 4 to inner margin by some orange cinnamon shading; a marginal narrow whitish line edged with hair brown scaling, the termen narrowly ochraceous buff; cilia silvery gray. Hind wing to postmedial line suffused with mikado brown; a little white at base; an antemedial white fascia edged with fuscous; a black point at end of cell; a postmedial white line deeply outcurved beyond cell, distally finely edged with black, proximally preceded by some snuff brown scaling; terminal space ochraceous buff, divided by a white line edged with black; cilia hair brown; the apex produced at vein 7. Wings below with the markings reduced.

Expanse, 18 mm.

Habitat.—Chejel, Guatemala.

Type.—Cat. No. 27010 U. S. N. M.

***Ambia cillanalis*, new species.**

Male.—Palpi, head and thorax white, the patagia with two brown spots and tipped with light cadmium. Abdomen white, with light cadmium transverse bands except on basal segment; abdomen below light buff with segmental lines. Wings white, the markings mostly light cadmium. Fore wing: subbasal black points on subcostal and median, the latter followed by a small light cadmium spot and another black point; an antemedial fascia outangled below cell followed by a parallel medial fascia angled below vein 2; a broad postmedial fascia outbent, suffusing with a subterminal band above vein 2 and with an elongated spot on inner margin, this latter also suffusing with the narrow terminal band; a fuscous oblique streak on postmedial at discocellular, this fascia followed by a triangular spot resting on costa, its apex at vein 4; all the markings finely edged with black. Hind wing: a broad antemedial, medial and postmedial fascia, somewhat sinuous; a narrow terminal band suffusing with postmedial at anal angle, a few black and white points on it between veins 3 and 6. Hind wing below white, the fascia seen in transparency; no terminal band.

Expanse, 14 mm.

Habitat.—Geldersland, Surinam.

Type.—Cat. No. 27011 U. S. N. M.

***Ambia cantiusalis*, new species.**

Female.—Head and body white; two pale orange yellow lines on collar and one across patagia, similar lines on abdomen above. Wings white, the markings chiefly light orange yellow. Fore wing: a subbasal and a broader antemedial line; a fine fuscous outcurved medial line connected with postmedial by an orange yellow bar on vein 1; a small spot in end of cell; an incurved fuscous lunule containing a white line; postmedial line fine, fuscous, curved from vein 5 to lower end of cell, then erect to inner margin, the curve from vein 5 filled in

with pale orange yellow to cell, and a similar streak on veins 6 and 7, a small spot on costa above it; a subterminal band edged with black, parallel with postmedial to near end of cell; a terminal band inwardly edged by a fine black line upcurved at vein 1 to subterminal. Hind wing; an antemedial broad line; medial fascia broad on costa, its proximal edge straight, its discal edge finely black upcurved from vein 4 to vein 2, becoming narrower to inner margin, a white space on it from within cell to its outer edge, the discocellular line remaining pale orange yellow; subterminal and terminal lines sinuous, parallel, partly edged with black and suffusing at apex and anal angle; cilia white with smoky mottling at apex, vein 4 and below vein 2.

Expanse, 15 mm.

Habitat.—Col. Perene, Peru.

Type.—In Cornell University

Paratype.—Cat. No. 27107 U. S. N. M.

Near *A. dendalis* Druce. Collected by the Cornell University Expedition.

***Parambia cedroalis*, new species.**

Female.—Palpi whitish with pale avellaneous tips to joints, head, collar and thorax white; abdomen above fuscous black, the basal segment white with subdorsal fuscous points, the others with fine white segmental lines; body below and legs avellaneous, the fore tarsi with whitish rings. Fore wing: base white expanding to middle of costa, limited by a fine oblique black line from inner margin to subcostal, continued as a fine brownish line outangled on costa, the costa beyond creamy white; the space beyond from subcostal to inner margin drab gray thickly irrorated with chaetura drab and with cinnamon brown shading along the black line; a fine white outcurved line from costa before apex, becoming terminal at vein 3 with black points at vein 2 and submedian fold; the apex creamy white; cilia drab. Hind wing: costal half white, the lower half drab; a black medial spot below vein 2 extending to inner margin, with another spot below it on inner margin; a fine postmedial white line from vein 4 to inner margin above angle followed by black scaling from below vein 3; some terminal drab shading to apex; a terminal white line with black points on interspaces, and a line near angle. Hind wing below avellaneous, the termen narrowly white with short black lines on interspaces.

Expanse, 12 mm.

Habitat.—Alto del Cedro, near Santiago, Cuba.

Type.—Cat. No. 27012 U. S. N. M.

Allied to *P. glenealis* Dyar.

***Oligostigma odrianalis*, new species.**

Male.—Body above drab, some white on collar behind; the patagia posteriorly, a small dorsal spot on metathorax and the third segment of abdomen white; body below and legs white. Fore wing snuff brown, the costal margin broadly suffused to outer line with pale ochraceous buff; outer line white, remote, parallel with termen from costa to vein 4 then gradually expanding and incurved to inner margin, followed by a snuff brown narrow band parallel throughout with

termen, then a fine white line and the terminal antimony yellow band, the latter edged with black more heavily proximally; inner margin terminally antimony yellow; cilia grayish. Hind wing white; a point at base, a subbasal fascia and a postmedial fascia snuff brown, the latter from the marginal antimony yellow band below costa to near inner margin where the marginal band is upbent along it; the marginal band edged with black, the outer edging forming below apex three triangles filled in with white; cilia with a fine black line near base.

Expanse, 21 mm.

Habitat.—Sao Paulo, S. E. Brazil.

Type.—Cat. No. 27013 U. S. N. M.

Allied closely to *O. juncealis* Guenée; vein 4 and 5 on hind wing midway from cell, in *juncealis* they diverge close to termen. All our specimens of *O. juncealis* are from French Guiana and are considerably larger than the figure in Guenée's *Pylalites*, and also have in the male a distinct swelling at the base of costa.

***Oligostigma andeolalis*, new species.**

Female.—Palpi and head tiller buff; body above drab, the abdomen with transverse fuscous black bands. Fore wing: base light cinnamon drab; a basal black spot on costa; subbasal and antemedial blackish lines, the space limited by a more pronounced black line outcurved on costa, slightly inbent from within cell to inner margin; medial and costal space within postmedial saccardo's umber; postmedial line almost vertical from costa to vein 4, retracted around the whitish discocellular and downbent to inner margin, followed throughout by a narrow whitish shade and then by a parallel wood brown shade slightly suffused with ochraceous on costa; terminal band antimony yellow proximally edged by a black line preceded by a thick white line; cilia fuscous at base. Hind wing whitish; an antemedial broad medial and a postmedial saccardo's umber fascia, the medial not reaching costa; a terminal antimony yellow band proximally edged by a black line, terminally with black points on interspaces. Hind wing below with the fascia narrower.

Expanse, 16 mm.

Habitat.—Castro, Parana, Brazil.

Type.—Cat. No. 27015 U. S. N. M.

The palpi have the third joint angled back against frons.

***Aulacodes congallalis*, new species.**

Female.—Body and wings bone brown, the abdomen with dorsal segmental lines, the wings with white lines. Fore wing: antemedial line fine, outcurved; median line vertical from costa, outbent from fold to inner margin; postmedial very faint, retracted from vein 3 to the whitish discocellular and downcurved; subterminal line broader from costa to vein 5, and near tornus; cilia black at base. Hind wing: a fine antemedial and postmedial line; the subterminal distinct near apex and anal angle.

Expanse, 13 mm.

Habitat.—Cayuga, Guatemala.

Type.—Cat. No. 27015 U. S. N. M.
Nearest *A. obtusalis* Dyar.

***Aulacodes julittalis*, new species.**

Female.—Palpi bister tipped with white; frons white with a medial bister streak; body bister, the patagia tipped with white, the second segment of abdomen mottled with white and a white band on last segment; body below silvery white, the segments of abdomen with tawny olive bands. Fore wing bister; costal edge mostly white; a fine white antemedial line almost vertical; a fine white medial line, outbent to median, below it more oblique but almost obsolete, followed in cell by a sayal brown patch; a fine white postmedial line vertical on costa, oblique on discocellular to vein 3, then upcurved to costal margin, but slightly inbent at vein 7 and emitting a short white streak bent towards discocellular; a subterminal dentate white line distally edged with sayal brown; termen narrowly pinkish buff with a fine terminal bister line; cilia snuff brown and white crossed by a dark line. Hind wing bister; medial space white from below costa to near inner margin, preceded and followed by a fine white line from costa to inner margin; termen narrowly mottled with white and pinkish buff; an interrupted terminal bister line; cilia with a bister line very faint towards anal angle.

Expanse, 13 mm.

Habitat.—Alhajuelo, Panama.

Type.—Cat. No. 27016 U. S. N. M.
Collected by A. Busck.

***Aulacodes nissenalis*, new species.**

Female.—Body white; a tawny olive point on vertex, line on shoulders and faint dorsal spots on abdomen, the latter with a dorsal and subdorsal points on basal segments, a fuscous black band on second segment and subdorsal black points on next to last segment. Wings white, the markings fine, tawny olive. Fore wing: a point at base of costa; a subbasal oblique line on costa and point beyond in cell, also a point below it on vein 1; an antemedial line from cell to inner margin; a large annulus in cell, and on discocellular; a medial lunule below cell and short streak on vein 1; postmedial streaks on veins 3, 4, 5, 6 and discal fold, followed by a line inangled above vein 5, inbent below vein 2; subterminal and terminal lines. Hind wing: antemedial and medial wavy lines, a line between them in cell; postmedial line deeply incurved below vein 6 and again below vein 2, preceded by streaks on veins 3 and 4; a postmedial line from costa to below vein 2; a terminal line; cilia white crossed by a smoky line.

Expanse, 19 mm.

Habitat.—Callao, Peru.

Type.—Cat. No. 27017 U. S. N. M.

Received from Mrs. M. J. Pusey. Allied to *A. citronalis* Druce.

***Aulacodes fiachnalis*, new species.**

Female.—Body chaetura drab; abdominal segments with faint whitish segmental lines, the basal segment with some white points. Wings hair brown.

Fore wing: darker irrorations forming indistinct subbasal and antemedial bands, partly interrupted; a faint very fine whitish medial line, outcurved on costa, with dark scaling distally from cell to inner margin; postmedial line fine, but more distinct, incurved on costa, then outcurved, slightly inangled at vein 2; marginal black points, almost forming a line from near apex to submedian fold; a very fine terminal dark line and two similar lines at base of grayish cilia which are also tipped with black from apex to submedian fold, below which the cilia are whitish; the apex is slightly produced. Hind wing: costa whitish, the hair brown scaling linear; medial space from vein 5 to below vein 2 chaetura drab limited by a whitish postmedial line which does not reach margin; a fine marginal black line from vein 7 to below vein 2; a faint terminal line; cilia as on fore wing. Wings below with inner margins broadly whitish.

Expanse, 11 mm.

Habitat.—Alhajuelo, Panama.

Type.—Cat. No. 27018 U. S. N. M.

Collected by A. Busck.

***Aulacodes grimbaldalis*, new species.**

Female.—Palpi, head and basal segment of abdomen white, body above otherwise cinnamon buff with some white on collar behind and white segmental lines; body below silvery white. Fore wing cinnamon buff; a basal and antemedial whitish fascia; slightly darker medial and postmedial lines, the former evenly curved with some whitish proximally, the latter parallel, but slightly incurved below vein 2 with whitish distally; small marginal white spots above veins 7 and 8, and a terminal black point on submedian fold; cilia silvery cinnamon buff. Hind wing: base silvery white crossed by an antemedial cinnamon buff shade from cell to inner margin, connected with medial line by a narrow similar shade below vein 2; the medial line not reaching costa edged distally with white; space beyond cinnamon buff; a terminal black point below vein 2 and a white line from above it to anal angle; cilia cinnamon buff tipped with white.

Expanse, 11 mm.

Habitat.—Cayuga, Guatemala.

Type.—Cat. No. 27019 U. S. N. M.

***Aulacodes odulphalis*, new species.**

Female.—Palpi white; head and body above warm buff slightly darker on patagia; some white dorsally on basal segment of abdomen; body below light buff. Fore wing whitish, the veins warm buff to outer line, the medial and postmedial space irrorated with hair brown scales; subbasal, antemedial and medial warm buff spots on costa with faint traces of lines; a hair brown oblique streak on discocellular; outer line close to subterminal, warm buff on costa, black from vein 7 to vein 2, slightly incurved and inangled below fold; subterminal line warm buff, faint and parallel below vein 2 with outer line preceded and followed by white especially on distal side; a fine terminal broken black line; cilia with basal golden tipped with white and separated by a very fine blackish line. Hind wing: base, costal and inner margins silvery white; the outer space warm

buff; a medial band from below costa of hair brown irroration with tufts of long hair brown scales to near anal angle; a blackish postmedial line, upcurved below vein 2 and downbent to anal angle; a similar subterminal line with silvery scales distally; termen from vein 5 to vein 2 with broad ochraceous orange spots across veins distally edged with black and with paired black points on inter-spaces; from vein 5 to costa a fine terminal black line; cilia silvery white.

Expanse, 13 mm.

Habitat.—Cayuga, Guatemala.

Type.—Cat. No. 27020 U. S. N. M.

Near *A. calistoalis* Walker.

• *Aulacodes adjutrealis*, new species.

Male.—Body white; base of palpi hair brown; a fuscous black line across front of collar, and one across front of thorax; fuscous segmental lines on abdomen above. Wings white the lines fuscous black. Fore wing: streaks from base above subcostal, in cell, below median upbent from near base of inner margin, and a shorter streak more remote from base upbent and along vein 1, followed by a fine line outbent on costa and well outcurved below it; a fine line just beyond middle slightly outbent and straight from costa to inner margin, followed by a black edged buckthorn brown fascia, bifurcating near inner margin, the proximal band narrower and vertical, the distal band shortly outbent and upturned as a fuscous black line to costa, the enclosed white space containing a U shaped line; a subterminal line not reaching costa; an interrupted finer terminal line; cilia light buff at base followed by a smoky shade and white tips. Hind wing: a point at base; an antemedial line, a double medial line conjoined on costa, a postmedial line expanding between veins 6 and 2, containing a buckthorn brown line, a subterminal line and an interrupted terminal line; cilia as on fore wing. Fore wing below with the markings all hair brown.

Expanse, 16 mm.

Habitat.—Col. Perene, Peru.

Type.—In Cornell University.

Paratype.—Cat. No. 27128 U. S. N. M.

Collected by the Cornell University Expedition. Differs from any known species by the longitudinal streaks at base of fore wing.

• *Parthenodes briocusalis*, new species.

Female.—Body above and wings sepia, underneath and legs drab, the venter mostly white with sepia bands and spots. Fore wing: lines whitish rather indistinct; an outcurved subbasal and antemedial line; an outbent medial line across costa and cell and a parallel line beyond cell; postmedial line sinuous, retracted to postcellular line and inbent to medial line at cell, then outcurved to inner margin; small marginal white spots, indistinct except one above and one below vein 6. Hind wing: an antemedial whitish line from within cell, downbent to below middle of inner margin, and a similar wavy line from discocellular to inner margin near angle; a subterminal wavy line near anal angle and traces of whitish marginal spots.

Expanse, 15 mm.

Habitat.—Geldersland, Surinam.
Type.—Cat. No. 27021 U. S. N. M.
 Near *P. scaralis* Schaus.

***Parthenodes dabiusalis*, new species.**

Female.—Palpi, head and thorax white; abdomen white, the two basal and last segment with transverse cinnamon buff bands, the other segments with fuscous black bands. Fore wing: base white to a fine outcurved medial black line, almost entirely suffused with cinnamon buff, leaving a little white on costa and along the line, expanding towards inner margin; the line followed on costa by a triangular white spot, and below vein 2 by a broad fuscous black spot, otherwise by sayal brown to the very faint postmedial line which consists of blackish irrorations, outcurved at vein 5 incurved below vein 2, followed by blackish irrorations between veins 6 and 3, by white below vein 2 and a large clay color patch to near termen; a terminal clay color band edged with black, preceded by a white crescent from vein 7 to vein 4, by black below it to tornus interrupted by a small white spot between veins 3 and 2; cilia white except between veins 3 and 4 where it is black, also with black at base and at apex. Hind wing white; a short antemedial bister line on inner margin; some very fine and faint tilleul buff medial shading ending on inner margin in a broad black fascia; a subterminal avellaneous line and similar narrow shading on termen; subterminal and terminal shading yellowish towards anal angle; cilia white with some interrupted black marks near base.

Expanse, 18 mm.

Habitat.—Popocatepetl Park, Mexico.
Type.—Cat. No. 27022 U. S. N. M.
 Near *P. mediocinctalis* Hampson.

***Parthenodes gualbertalis*, new species.**

Female.—Body drab irrorated thickly with black; whitish segmental lines on abdomen dorsally; body below whitish, the abdomen with ventral black points; fore legs black, the tarsi white. Wings pale drab gray thickly irrorated with hair brown. Fore wing: a subbasal black line from cell to inner margin; before middle a broader black line from cell, slightly inbent to inner margin; a quadrate black spot in end of cell suffusing with a fuscous costal spot; discocellular line defined by some black scaling; an outer distinct whitish line followed by irregular black suffusions almost forming a subterminal line; termen very narrowly whitish with black points; cilia black tipped with white. Hind wing: a fine blackish line from cell before vein 2 to inner margin at postmedial line, this latter whitish with some black scaling proximally; a fine dark line terminally preceded by some very faint whitish scaling; cilia white with a black line at base.

Expanse, 13 mm.

Habitat.—Geldersland, Surinam.
Type.—Cat. No. 27023 U. S. N. M.

***Bradina finbaralis*, new species.**

Female.—Palpi warm buff with two oblique sepia streaks. Body above fuscous black; a light buff line on patagia; abdomen with white bands on second and fourth segments, some yellow ocher on fifth, last and anal segments, also three silver segmental lines; body below white. Fore wing sepia suffused with purple, the markings maize yellow, somewhat darker on costa; a point at base and subbasal line; a broad antemedial fascia, vertical; a large medial spot from costa to below submedian fold; a fine lunule on discocellular and a small triangular spot on costa beyond; an apical spot and termen narrowly from apex to vein 3; a small black subterminal spot above vein 7, and a line below it suffusing with dark portion; base of cilia silver. Hind wing partly maize yellow; subbasal sepia fascia suffusing with the inner marginal sepia space which extends to near angle, is irregular inwardly, suffusing with a small spot below vein 2; outer half from costa to vein 2 sepia, its inner edge outcurved, suffusing with a subterminal sepia spot below vein 2 which is also connected with a marginal spot near angle, the termen below them maize yellow; a terminal maize yellow line from apex to vein 4; base of cilia silver.

Expanse, 15 mm.

Habitat.—Cordoba, Mexico.

Type.—Cat. No. 27024 U. S. N. M.

***Bradina aaronalis*, new species.**

Male.—Palpi maize yellow with two oblique black streaks; frons maize yellow; vertex sepia with a medial yellow line; collar sepia medially, laterally maize yellow; thorax sepia, the patagia mottled with yellow; abdomen dorsally sepia at base followed by a maize yellow band and sepia mottling on third segment, the following segments light orange yellow with fine black and white segmental lines; anal tufts white and black; body below and legs white. Fore wing maize yellow; a basal and a subbasal black line; a thick fuscous black vertical antemedial line suffusing on inner margin with a large spot beyond it which is upbent to cell at vein 2 and then outcurved to inner margin; discocellular edged by a thick sepia line; a broad outer warm sepia fascia from costa to below vein 3, vertical to vein 5 and slightly outbent below it, between vein 4 and 3 touching the terminal light cadmium band, this latter with some small sepia spots on its inner edge below costa and above tornus; cilia maize yellow with a thick silver line at base and blackish tips. Hind wing maize yellow; a subbasal black fascia; a medial fuscous black patch from below vein 2 expanding on inner margin; a broad postmedial fuscous black fascia from costa to vein 3, suffusing between veins 4 and 5 with the black edging of the terminal light cadmium band, this black edging obsolete from before vein 2, a small subterminal dark spot below vein 2 and another at vein 1; cilia as on fore wing.

Expanse, 15 mm.

Habitat.—Cayuga, Guatemala.

Type.—Cat. No. 27025 U. S. N. M.

Allied to *B. finbaralis* Schaus.

***Bradina hemmingalis*, new species.**

Female.—Body and wings above dusky hair brown; body below dull white. Fore wing: a wavy outbent antemedial black line; a black spot on discocellular; broad outer black shade from costa, diffuse on inner side narrowing to vein 2 where it is inbent a short distance then downbent to inner margin, and is followed from costa to vein 5 by a white line, broadish on costa; cilia hair brown with a darker line near base. Hind wing: a postmedial line retracted below vein 2 and downbent to inner margin; cilia white with a fuscous black line at base.

Expanse, 16 mm.

Habitat.—Jamaica, West Indies.

Type.—Cat. No. 27026 U. S. N. M.

***Camptomastix baracoalis*, new species.**

Female.—Palpi vinaceous brown. Head and thorax russet vinaceous; abdomen above vinaceous drab, the anal segment russet vinaceous; body below and legs white. Fore wing drab irrorated and suffused with russet vinaceous on termen with benzo brown; a triangular buff yellow spot on middle of costa, its apex at lower angle of cell, edged behind by a ferruginous line which extends to base of costa and distally as a streak below costal edge which is buff yellow; cilia white except from just above vein 2 to vein 4 where it is benzo brown and the margin is produced. Hind wing mostly drab, except costa which is broadly white to near apex.

Expanse, 13 mm.

Habitat.—Baracoa, Cuba.

Type.—Cat. No. 27027 U. S. N. M.

This species only differs from typical *Camptomastix* in the produced apex and middle of termen of fore wing.

***Deuterophysa obregonalis*, new species.**

Male.—Body above and wings saccardo's umber, the abdomen with white segmental lines above and below. Fore wing: a faint darker antemedial line slightly outcurved; a faint darker medial fascia; a large white postmedial spot on costa, narrower and rounded at vein 4 edged by a fuscous black line, a fuscous black terminal line; cilia white below apex and above tornus. Hind wing: a faint whitish postmedial line slightly outcurved beyond cell; a fuscous black terminal line; cilia partly white.

Expanse, 19 mm.

Habitat.—Slopes of Popocatepetl, Mexico, at an elevation of 10,000 feet.

Type.—Cat. No. 27028 U. S. N. M.

***Stenia amblalis*, new species.**

Male.—Antennae serrate with white cilia. Palpi fuscous the fringe mottled with whitish; head buffy brown; thorax brown mottled with gray; abdomen above cinnamon, segments 2 to 5 with broad black bands and white segmental lines, underneath snuff brown. Fore wing white suffused with light buff and

irrorated with fuscous and black; base of costa black; a subbasal black point in cell; antemedial line fine black outangled on median followed in cell by a small black ocellus; costa from antemedial to apex clay color with black spots; two small white spots on discocellular edged with black; postmedial line black distally edged with white, wavy, slightly outbent from costa and vein 3, curved and retracted to lower end of cell, downbent and outcurved across fold, followed by a broad fuscous shade crossed by black lines on veins; subterminal white scaling from below costa to vein 5; a terminal black line, expanding into small spots. Hind wing whitish, the costa and inner margin smoky gray; medial black irroration not reaching costa, its lower outer edge continued as a smoky shade to inner margin; a wavy postmedial fuscous line downbent at vein 2 to termen; termen broadly suffused with fuscous; a black marginal line coalescing with proximal black spots; cilia on both wings white crossed near base by a black line inwardly edged with buff, and with black spots on fore wing at apex and veins 4 and 3, on hind wing at vein 6 and vein 4.

Expanse, 12 mm.

Habitat.—Jalapa, Mexico; also from Guatemala.

Type.—Cat. No. 27109 U. S. N. M.

Stenia nennuisalis, new species.

Female.—Palpi head and thorax buffy brown, some white hairs on metathorax; abdomen above drab irrorated with fuscous, white segmental line at base and on terminal segments. Wings tiller buff irrorated with buffy brown. Fore wing: antemedial line light buff outangled in cell, outwardly shaded with fuscous from subcostal to inner margin; a fuscous annulus on discocellular; postmedial line light buff broadly shaded on both sides with fuscous faintly wavy, inangled at discal fold retracted at vein 2 towards discocellular which it does not reach and downbent to inner margin; terminal triangular fuscous spots connected by a fine line; cilia buff white crossed by two dark lines. Hind wing more whitish and thinly irrorated to the postmedial line which is whitish defined by slightly darker shading; termen broadly more thickly irrorated with buffy brown; a diffuse terminal fuscous line; cilia as on fore wing. Hind wing below whiter except on costa; a double dark streak at discocellular; terminal line reduced to spots.

Expanse, 28 mm.

Habitat.—Trujillo, Peru.

Type.—Cat. No. 27110 U. S. N. M.

Allied to *S. gelliasalis* Walker.

Stenia dominicalis, new species.

Female.—Palpi, body above and wings buffy brown, the palpi below and throat white; abdomen below whitish buff irrorated with drab; fore coxae and tarsi olive brown, the latter with white rings; mid and hind legs light buff, the spurs fuscous black. Fore wing: antemedial line fuscous slightly outangled on median, followed in cell by a small fuscous annulus and a larger annulus over discocellular; postmedial line fuscous distally edged with white except where retracted along vein 2, dentate from costa, inangled at fold, retracted at vein 2

to near cell, curved and slightly outbent below vein 2 to inner margin; terminal black spots on interspaces; cilia buffy brown with a pale line at base. Hind wing: a postmedial pale line dark shaded on both sides, vertical from costa to vein 2 at termen, retracted and very faint to inner margin; small triangular black terminal spots. Hind wing below whiter, the postmedial line curved, inangled at fold; a dark spot on discocellular; termen broadly buffy brown. Male antennae with tuft before middle.

Expanse, 18 mm.

Habitat.—Dominica, B. W. I.

Type.—Cat. No. 27111 U. S. N. M.

Near *S. declivalis* Dyar.

***Stenia reddalis*, new species.**

Male.—Antennae serrate ciliate with a tuft at one-third from base. Body above hair brown, underneath whitish thickly irrorated with hair brown; mid and hind legs drab gray, the tarsi whitish, fore legs hair brown, the tarsi with pale rings. Fore wing thickly irrorated with hair brown; a fuscous black diffuse antemedial line slightly outbent; reniform faintly paler, very indistinct; postmedial line pale with fuscous black shading proximally, wavy, slightly incurved at discal fold, retracted at vein 2 to lower angle of cell and downbent to inner margin; a very fine interrupted terminal fuscous line; cilia hair brown crossed by two black lines, with a whitish line at base interrupted by black cilia at veins. Hind wing whitish irrorated with hair brown more thickly on termen especially at apex; a very fine terminal line; cilia white crossed by a single black line and without black spots at veins. Hind wing below whiter with irrorations on costa and apex; traces of a fine dark postmedial line.

Expanse, 13 mm.

Habitat.—Cayamas, Cuba.

Type.—Cat. No. 21112 U. S. N. M.

Allied to *S. dominicalis* Schaus.

***Stenia midalis*, new species.**

Female.—Body and wings cupreous buffy brown, palpi white below, legs avellaneous. Fore wing: lines fine, fuscous; a vertical subbasal line; antemedial line wavy, outangled on median; a streak on discocellular; postmedial wavyly dentate slightly outcurved to above vein 2, retracted to near discocellular and downbent, terminal fuscous spots; cilia hair brown darker shaded at base beyond a pale line. Hind wing: a streak on discocellular; postmedial line incurved below vein 2 and downbent to inner margin close to anal angle; a terminal fuscous line; cilia mostly white with a fuscous line near base. Wings below paler, the lines as above.

Expanse, 21 mm.

Habitat.—Quevedo, Ecuador.

Type.—Cat. No. 27113 U. S. N. M.

***Stenia marialis*, new species.**

Female.—Palpi fuscous, white below; head and thorax drab; abdomen above white at base, with narrow dorsal hair brown shade, the following segments hair

brown with fine segmental white lines; abdomen laterally and below silvery white; legs mostly buff white, the fore legs streaked with drab. Fore wing drab with darker markings; an outbent antemedial line; a lunule on discocellular; postmedial line vertical to vein 2, retracted towards cell to above vein 2, and downbent, followed by a very faint light drab narrow shade; terminal dark points; cilia light buff at base followed by a drab line, the tips broadly white. Hind wing white, thinly scaled, the termen suffused with drab; a hair brown postmedial wavy line slightly retracted at vein 2. Fore wing below paler without the antemedial line.

Expanse, 20 mm.

Habitat.—Volcan de Santa Maria, Guatemala.

Type.—Cat. No. 27114 U. S. N. M.

***Stenia styxalis*, new species.**

Male.—Antennae ciliated. Body and wings above hair brown, the latter without markings; cilia fuscous black with a very faint paler line at base. Palpi below white; abdomen below whitish buff; legs whitish buff, the fore legs except tarsi hair brown. Wings below whitish, the fore wing and termen of hind wing suffused with hair brown; dark lines on discocellulars; a faint dark postmedial line, retracted on both wings below vein 2 to near cell.

Expanse, 20 mm.

Habitat.—St. Jean, French Guiana.

Type.—Cat. No. 27115 U. S. N. M.

***Stenia cronanalís*, new species.**

Male.—Palpi fuscous above, white below. Body white; a fuscous line on collar outwardly; a segmental black line between first and second segments of abdomen, the following three segments with dorsal fuscous spots, the terminal segments fuscous black dorsally with white segmental lines; fore tibiae and tarsi fuscous black. Wings white with terminal fuscous black points, the lines fine, buffy brown. Fore wing: costal margin suffused with buffy brown; an out-curved antemedial line followed by a broken ocellus in cell at subcostal; discocellular defined by lines; postmedial finely wavy, vertical to vein 2, retracted, almost obsolete to below cell and wavy to inner margin. Hind wing: a line on discocellular; postmedial line lunular between veins 5 and 2, retracted but faint to below cell and curved to inner margin.

Expanse, 22 mm.

Habitat.—El Campamiento, Col. Perene, Peru.

Type.—In Cornell University.

Paratype.—Cat. No. 27116 U. S. N. M.

Near *Stenia costalis* Hampson. Collected by the Cornell University Expedition.

***Stenia bademusalis*, new species.**

Male.—Palpi fuscous above, white below. Body white; a fuscous line on collar laterally and shoulders below; abdomen with small dorsal buffy brown spots except on three basal segments. Fore wing white; costa suffused with

buffy brown; a faint buffy brown spot in cell and discocellular lines; postmedial line faint, buffy brown, slightly outbent from costa to termen at vein 2, retracted to vein 3 and cell but almost imperceptible, then vertical to inner margin; terminal sayal brown points; cilia white. Hind wing white; a faint postmedial line outcurved between vein 5 and termen near tornus; an interrupted terminal sayal brown line, faintly lunular.

Expanse, 23 mm.

Habitat.—Hacienda San Juan, Col. Perene, Peru.

Type.—In Cornell University.

Paratype.—Cat. No. 27117 U. S. N. M.

Near *S. costalis* Hampson. Collected by the Cornell University Expedition.

***Stenia carthagalis*, new species.**

Male.—Palpi fuscous above, white below. Head, thorax and base of abdomen white, the latter otherwise light buff dorsally with white segmental lines. Wings whitish buff the lines fine hair brown; terminal blackish points; cilia tipped with white. Fore wing: costal margin and postmedial space from cell to line finely irrorated with hair brown; antemedial line outcurved followed by a dark point in cell at subcostal; a black line on discocellular; postmedial line from a black spot on costa, wavy, outcurved from vein 5 to vein 2, retracted to near lower angle of cell and erect to inner margin; the termen suffused with wood brown, broadly so at apex. Hind wing: a black spot on discocellular; postmedial line inangled at discal fold, outcurved to near termen at vein 2, retracted and downbent to inner margin near tornus.

Expanse, 16 mm.

Habitat.—El Campamiento, Col. Perene, Peru.

Type.—In Cornell University.

Paratype.—Cat. No. 27118 U. S. N. M.

Collected by the Cornell University Expedition.

***Stenia primolalis*, new species.**

Female.—Head white, a buffy citrine line across top of frons, and a similar mark on vertex; body white, the tegulae fuscous in front; a honey yellow spot on shoulders; legs whitish with some buffy markings. Wings white, the markings honey yellow. Fore wing: the basal half of costa honey yellow; an antemedial inbent fascia, interrupted at median; a medial fascia inbent with a fine white line on discocellular; a postmedial fascia narrow on costa, expanding to inner margin at tornus; a large terminal spot from below costa to vein 2, leaving a narrow incurved white line between it and the postmedial. Hind wing: a medial fascia; postmedial terminating at anal angle; a terminal spot from apex to vein 3. Fore wing below pale isabella color, with some whitish markings on disc. Hind wing below white, the markings duller; the medial fascia with a whitish dark edged spot on discocellular.

Expanse, 14 mm.

Habitat.—Geldersland, Surinam.

Type.—Cat. No. 27119 U. S. N. M.

***Stenia gulanalis*, new species.**

Female.—Body white; some dorsal drab shading on three terminal segments of abdomen. Wings white, the lines isabella color. Fore wing: costa suffused on basal half with light drab; antemedial line slightly outbent, beyond it a small drab spot below subcostal; discocellular defined by dark lines from costa; postmedial line remote, vertical to vein 5, outcurved to below vein 3 and retracted to lower angle of cell, then vertical to inner margin; termen suffused with isabella color; cilia white. Hind wing: a faint line on discocellular; postmedial line outcurved from vein 5 to vein 2 and retracted to near cell; terminal suffusions, interrupted between veins 4 and 2.

Expanse, 15 mm.

Habitat.—St. Jean, French Guiana.

Type.—Cat. No. 27120 U. S. N. M.

***Stenia turiafalis*, new species.**

Male.—Body white, some buffy brown on collar and shoulders; abdomen above buffy brown. Wings white, the markings buffy brown. Fore wing: the costal margin buffy brown, reaching vein 6 except at termen; traces of an antemedial line below cell and on inner margin; an annulus in cell from subcostal to near median; discocellular long, oblique, defined by buffy brown lines; postmedial line vertical to vein 2 close to termen, retracted to end of cell at vein 3, curved across vein 2 near cell and downbent, slightly sinuous to inner margin; broad streaks between vein 4 and discal fold on terminal space; veins 1 and 2 slightly suffused with buffy brown; a terminal line, punctiform from discal fold to apex; cilia white with brownish spots beyond base. Hind wing: a streak on discocellular; postmedial line slightly wavy, vertical from costa to termen at vein 2, retracted to cell, curved and sinuous to inner margin; a terminal line not reaching anal angle. Fore wing below with broad diffused streaks on veins 2-5.

Expanse, 20 mm.

Habitat.—Peru?

Type.—Cat. No. 27121 U. S. N. M.

***Stenia caclamalis*, new species.**

Male.—Antennae ciliated; head and thorax drab, the latter with some white; abdomen white dorsally suffused with drab except at base. Fore wing with the apex produced and acute, thinly scaled, white, the costa and termen broadly suffused with aeneous drab. Hind wing semihyaline white; some drab shading and terminal points at apex. Hind wing below with a drab streak on upper discocellular; a fine postmedial line on costal margin.

Expanse, 22 mm.

Habitat.—Colombia.

Type.—Cat. No. 27122 U. S. N. M.

***Stenia cayugalis*, new species.**

Female.—Palpi white with a fuscous streak above. Body and wings chamois, the markings fuscous, the lines consisting of fine diffused scales. Fore wing: basal half of costa with dark irrorations; antemedial line outcurved followed by a

small annulus in cell at subcostal; reniform defined by lines; postmedial line vertical from costa to discal fold where it is slightly inangled, then outcurved to vein 2, retracted and obsolescent to lower angle of cell and wavyly downbent to inner margin; terminal small triangular spots becoming linear towards apex; cilia smoky gray crossed near base by a macular black line. Hind wing: a sinuous medial line; postmedial line wavy to termen at submedian fold; a terminal line; cilia as on fore wing. Underneath paler, the markings a trifle finer.

Expanse, 14 mm.

Habitat.—Cayuga, Guatemala.

Type.—Cat. No. 27123 U. S. N. M.

Near *S. mononalis* Dyar, but much smaller.

***Stenia herreralis*, new species.**

Female.—Palpi fuscous, underneath white; head and thorax cinnamon drab; abdomen light buff, dorsally suffused with drab except on pale segmental lines. Fore wing whitish, thickly irrorated with drab, the lines fine hair brown; antemedial line outangled below cell; a small medial spot in cell; a line on discocellular; postmedial line slightly incurved from costa to vein 5, outcurved to below vein 3, retracted towards cell, downbent and outangled on fold; terminal black points on interspaces; cilia light buff at base followed by a hair brown line, the tips broadly silvery light buff. Hind wing white thinly irrorated with drab on outer half from costa to vein 2; a medial outcurved hair brown line; a postmedial line, inangled above vein 5, then downbent to termen below vein 2; an interrupted terminal line; cilia as on fore wing. Wings below buff white, the lines as above but punctiform. The wings broad.

Expanse, 18 mm.

Habitat.—Volcan de Santa Maria, Guatemala.

Type.—Cat. No. 27124 U. S. N. M.

***Stenia caulealis*, new species.**

Male.—Antennae pubescent. Body above silky hair brown, the base of abdomen white except a dorsal line; underside and legs silvery white, the fore legs partly hair brown. Fore wing aeneous hair brown, the cilia tipped with grayish. Hind wing semihyaline white, the termen suffused with aeneous hair brown. Fore wing below paler.

Expanse, 20 mm.

Habitat.—Volcan de Santa Maria, Guatemala.

Type.—Cat. No. 27125 U. S. N. M.

***Stenia beuvealis*, new species.**

Female.—Palpi fuscous black. Head and body white; neck behind fuscous; abdomen above with faint pale grayish bands. Fore wing white suffused with cream buff; costa fuscous to beyond middle; antemedial line cinnamon drab, outcurved below cell, followed by a fuscous spot at subcostal; discocellular defined by two fuscous lines; postmedial line black on costa, below it cinnamon drab, slightly outbent at fold and vertical to vein 2, retracted, but very faint, along vein 2, not reaching cell and downbent to inner margin; terminal fuscous points;

cilia cream white; a black point at apex. Hind wing white suffused with cream buff beyond cell to apex; a fine postmedial wavy line from costa to vein 2 at termen; a fine and faint terminal line; cilia as on fore wing, without the apical black point. Wings below whiter, the markings very faint.

Expanse, 14 mm.

Habitat.—St. Laurent, French Guiana.

Type.—Cat. No. 27126 U. S. N. M.

***Stenia branealis*, new species.**

Female.—Body and wings above cinnamon buff irrorated with drab and black. Palpi below and throat white; body below and legs buff white, the fore legs with some dark markings. Lines on wings fine, black. Fore wing: a subbasal black point on inner margin; antemedial line outcurved; a small ocellus at middle of cell on subcostal; two black lines at discocellular, the proximal line curved; postmedial line remote, wavy, inbent to vein 5 then outcurved and retracted to near cell, hardly traceable where retracted, downbent to inner margin; terminal black points; cilia cinnamon buff with faintly darker spots. Hind wing: a fine medial line; postmedial line outcurved and minutely dentate between veins 5 and 2, terminating at vein 2 near termen; a fine marginal crenulate line. Wings below paler with a few irrorations on fore wing; postmedial line as above; terminal black points on both wings; a black bar on discocellular of hind wing; antemedial line from vein 2 to inner margin.

Expanse, 17 mm.

Habitat.—Kingston, Jamaica.

Type.—Cat. No. 27127 U. S. N. M.

***Piletocera agathanalis*, new species.**

Male.—Fore wing with the costa straight, the apex rounded and somewhat produced, the termen incurved from vein 5 to vein 3. Palpi and head drab, collar and thorax pallid purplish gray, the patagia silvery; abdomen above drab gray, the base and anal segment white; body below white, the fore coxae cream color, a metallic brown shade at base of tarsi. Fore wing whitish, the costa cell and postmedial space before line suffused with purplish brown, the termen with fuscous; a fuscous spot at base of costa and a spot near base of inner margin; antemedial line fuscous, outcurved, almost angled at median; a fuscous black line on discocellular forming part of a fainter medial line, inbent from fold to inner margin; postmedial line rather remote, fuscous, vertical to discal fold, minutely wavy, slightly retracted below vein 3 and downbent to inner margin; faint terminal dark points; cilia whitish. Hind wing semihyaline, whitish, the termen suffused with purplish brown; a black point on discocellular; a dentate postmedial fuscous line to vein 3, retracted and forming a wavy medial line to inner margin; a fuscous terminal line; cilia whitish.

Expanse, 18 mm.

Habitat.—Tabernilla, Panama.

Type.—Cat. No. 27108 U. S. N. M.

Collected by A. Busck.

DESCRIPTION OF A NEW TERMITE FROM PORTO RICO.

BY THOS. E. SNYDER, *U. S. Bureau of Entomology, Washington, D. C.*

The Island of Porto Rico has a termite fauna of considerable interest, twelve species being known; four species belong to the family Kalotermitidae, one to the family Rhinotermitidae and seven to the family Termitidae. Among the most destructive known species in Porto Rico are the Kalotermitid *Cryptotermes brevis* Walker, the Rhinotermitid *Leucotermes tenuis* Hagen and the Termitid *Nasutitermes morio* Latreille.

Recently Prof. G. N. Wolcott has found a new Termitid in the subgenus *Tenuirostritermes* Holmgren; this species is characterized as follows:

***Nasutitermes* (*Tenuirostritermes*) *wolcottii*, new species.**

Soldier.—(Figs. 1 and 2). Head yellow-brown (light castaneous), beak darker, head constricted at about middle, with exception of depression at constriction, head and beak are in nearly a straight line in profile, head and beak with dense fairly long hairs and head with a few longer hairs, head widest posteriorly where broadly rounded. Small projections on front of head near beak. Beak slender and conical. Mandibler points vestigial (fairly short, slender and pointed).

Antenna yellow-brown, with 13 segments, pubescent; third segment subclavate, longer than second; fourth shorter than second segment; segments become longer to apex; last segment shorter, subelliptical.

Pronotum same color as head, darkest anteriorly where margin is slightly emarginate, saddle shaped, posterior margin slightly emarginate, margins with long hairs.

Legs yellow brown fairly elongate, slender, pubescent.

Abdomen yellow-brown, tergites with dense fairly long hairs and a row of longer hairs at the base of each tergite.

Measurements:

Length of entire soldier: 2.60 mm.

Length of head with beak: 1.05 mm.

Length of head without beak (to anterior): 0.70 mm.

Length of beak: 0.40 mm.

Length of pronotum: 0.12 mm.

Length of hind tibia: 0.70 mm.

Width of head (at widest point, posteriorly): 0.60 mm.

Width of head (at narrowest point, anteriorly): 0.42 mm.

Width of pronotum: 0.32 mm.

Worker: Head brown, hairy, antennae with 14 segments; post-clypeus twice as wide as long, projecting, bilobed.

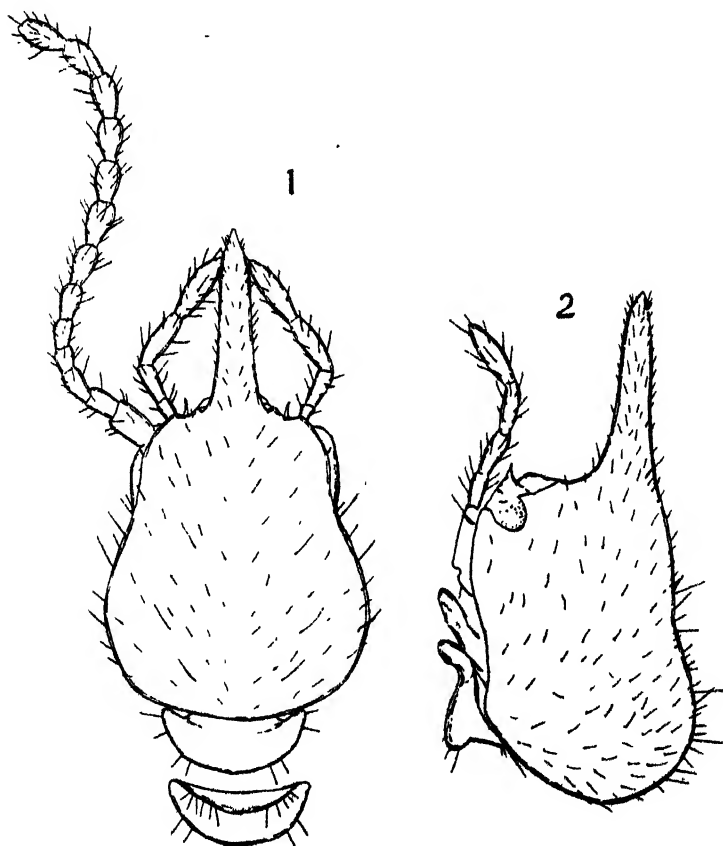
N. (Tenuirostritermes) wolcottii Snyder is a small, dark species, with a hairy, fairly prominently constricted head. It is smaller and darker and with a less constricted head than *T. tenuirostris* Desneux and differs from the Antillean species described by

Banks in 1919. The soldier of *T. strenuus* Hagen from Vera Cruz, Mexico, is unknown.

Type locality.—Boqueron, Porto Rico.

Described from seven soldiers collected with workers at the type locality by G. N. Wolcott on Nov. 7, 1923. These termites were in tunnels often nearly an inch wide (much wider than those constructed by *Nasutitermes morio* Latreille) and were on *Bucida buceras*. These shelter tunnels led to no nest but merely covered rotten wood. Species of *Tenuirostritermes* do not construct carton nests as do *Nasutitermes*.

Type, soldier.—Cat. No. 26757, U. S. N. M.



Soldier of *Nasutitermes* (*Tenuirostritermes*) *wolcottii* Snyder—1. Dorsal view of head and pronotum, also showing pronotum free from head; 2.—Lateral view of head and pronotum. (Drawings by Miss E. T. Armstrong.)

CRAMPTON ON THE LABIUM OF CERTAIN HOLOMETABOLA.¹

By ALEX. D. MACGILLIVRAY.

In a paper published in volume twenty-five of these Proceedings Dr. G. C. Crampton discusses with some detail the origin and structure of the labium of insects with a complete metamorphosis. He attempts by a series of figures of labia of species belonging to the Entopteraria to show how the various types were derived, or at least how he believes they were derived. The discussion is presented in such a convincing way, that as he says, "further discussion of this question would be merely a waste of time and space which might more profitably be devoted to other subjects."

With your permission I would like, nevertheless, to waste some of your space and time and to call attention to the fact that there is another way by which the facts presented can be explained. This different interpretation can be best followed and understood if the labia of some generalized insects are first described.

One of the most generalized types of labia known to me is that of the cockroach, as *Blatta*, figured by Yuasa and by Comstock. In this labium (Fig. 1) the proximal piece, the submentum, is the largest sclerite, deeply emarginate at the proximal and distal ends. In the emargination of the distal end there is located a small transverse sclerite, the mentum. To the distal end of the mentum is attached a large piece, which appears to be divided into two equal parts by a longitudinal furrow on the meson. This piece is formed by the fusion upon the meson of two sclerites and each portion is known as a stipula and the two together whether the furrow is distinct or not, as the stipulae (Yuasa, 1920). Each Stipula bears at its distal end two finger-like projections. Each lateral or outer projection is a paraglossa and each inner or mesal projection is a glossa. The outer or lateral margin of each stipula bears a shoulder-shaped sclerite, a palpiger, which in turn bears a three-segmented labial palpus.

The labium of insects is formed by the fusion on the median line during embryological development of two maxillae-like structures and for this reason the labium of insects is frequently designated as the second maxilla. The parts of the labium and maxillae are, therefore, homodynamous, the submentum with the subcardines, the mentum with the alacardines, the stipulae with the stipites, the palpigers with the palpifers, the labial palpi with the maxillary palpi, the paraglossae with the galeae, and the glossae with the laciniae.

Yuasa, who figures labia from representatives of each of the families of Orthoptera, brings out clearly that the mentum like the alacardo is an evanescent structure and present in only a few

¹Contribution from the Entomological Laboratories of the University of Illinois, No. 83.

insects. The mentum even when present is a small transverse area and in many, if not most Orthoptera, is represented by a very short indefinite neck-like structure (Fig. 2) which is not separated from the stipulae by a suture. This sclerite, the mentum, is, therefore, a sclerite that is only rarely present as a separate sclerite in insects with an incomplete metamorphosis and, if we may judge from the condition found in the Orthoptera, the mentum is always fused, where it can not be identified as a separate sclerite, with the stipulae.

Let us now select for comparison with *Blatta* a generalized type of labium characteristic of an insect with a complete metamorphosis. The best examples are found among the Tiger-beetles and the Ground-beetles, which all systematists are agreed in considering as the most generalized of the groups of beetles. A representative of any genus selected from either of these groups would answer our purpose, but one of the common Ground-beetles, *Harpalus*, has been selected. The labium of this insect is figured by Comstock and is shown in most textbooks.

The labium of *Harpalus* (Fig. 3) consists of a large dumb-bell shaped submentum with a small retractile mentum located in the emargination on the distal side of the submentum. To the distal end of the mentum there is attached a large lobe, the stipulae, the attachment of which is beneath a distal fold of the mentum. The distal end of the stipulae is composed of three projections, each outer or lateral projection is by comparison with *Blatta* evidently a paraglossa, but there is no suture separating it from a stipula as in the cockroach. The median projection undoubtedly represents the fused glossae and there is likewise no suture separating this median structure from the stipulae as in *Blatta*. Where the two glossae have been fused into a single projection, as in *Harpalus* and most beetles and many other insects, it has been designated as an alaglossa. It would be equally correctly designated as the glossae. Projecting from beneath the distal margin of the mentum and extending along each side of the stipulae, there are the cylindrical palpigera, which rest free upon the stipulae but are fused to the stipulae beneath the mentum. Each palpiger bears a three-segmented labial palpus. The sclerites of the labium of *Harpalus* are easily identified from those of *Blatta*, but the labium of *Harpalus* shows clearly that it has undergone some specialization. A comparison of the labium of *Harpalus* with those of other insect with a complete metamorphosis and biting mouth-parts will show that these latter labia show still other striking lines of specialization.

The mentum is a small submembranous area, sometimes completely concealed even in *Harpalus* because not fully extruded beyond the distal margin of the submentum. In the great

majority of beetles, probably ninety per cent or more, the mentum can not be identified and, as in insects with an incomplete metamorphosis, it is fused with the stipulae. It is evident then that the mentum in the Entopteraria like the mentum and alacardo of the Exopteraria is a sclerite found only in generalized insects.

Dr. Crampton bases his main findings upon the labia of six insects, if we may assume this from the order in which he takes up his discussion. These are: *Bombus*, one of the more specialized genera of Hymenoptera; *Rhipiphorus*, a beetle with a very unusually shaped head and greatly specialized mouth-parts; *Nemoptera*, one of the most peculiar genera of Neuroptera and highly specialized in all its structures; *Bittacus*, one of the most specialized in its mouth-parts of all the Mecoptera (even the most generalized mecopteran in this respect is highly specialized); *Empis*, one of the Dance-flies, which has a long slender, greatly modified labium; and *Pulex*, a flea, which has specialized mouth-parts, but since it has no bearing upon the later discussion is not considered. The five labia to be considered represent in each case the tips of more or less extreme lines of specialization.

For one unfamiliar with the structure of the labia of insects, particularly when studying the figures and descriptions of Dr. Crampton, his series seems invulnerable and incontestable. One does not observe the fact that they represent the tips of lines of evolution that show a convergence in form. The difficulties do not appear until the homology of the individual labia is examined.

If the mentum has been suppressed in the mouth of specialized biting insects, it is not likely to be present in sucking insects. The labium in the Hymenoptera always lacks as a separate area the small sclerite generally designated as the mentum. The submentum is generally small and frequently wanting. More concisely stated, the submentum is entirely membranous. The large area designated as the mentum in Dr. Crampton's Figure 7 is the combined stipulae and mentum. This area is quite generally, however, designated in all bees as the mentum and, I believe, incorrectly. There is no disagreement with the homology of the other parts of the labium of *Bombus*, except that the labial palpus consists of only three segments instead of four as the figure suggests.

The generalized labium of a beetle has already been described. The labia of this order are too well known to offer any difficulty. That the proximal piece of Figure 8 should be considered as the submentum and lora is difficult to understand, since they are homologous with the same sclerite (Fig. 3) always found in this situation and which has been repeatedly proven to be a part of the gula. This means then that the portion labelled as mentum is a greatly elongated submentum and that the mentum is indis-

tinguishable. The palpigers are correctly identified, but they are not fused upon the meson but rest upon the stipulae just as they do in *Harpalus*. The stipulae, which are the same as the portion labelled as prementum in this figure, can be identified between the palpigers, while the long slender structure with an emarginate end probably represents the combined paraglossae and glossae. The mentum of *Bombus* as labelled in Figure 7 is homologous, therefore, with the so-called prementum of *Rhipiphorus*.

The labium of *Nemoptera*, judging from Figure 9, is similar to *Rhipiphorus*. The long proximal area is the submentum. The sclerite beneath the palpigers is the stipulae or prementum, and the region labelled as ligula represents the combined glossae and paraglossae.

The figure of the labium of *Bittacus*, Figure 10, is illustrative of Dr. Crampton's method. The labia of the Mecoptera, even of the most generalized species, is greatly modified and specialized from that of the cockroach or ground-beetle. That *Bittacus*, which has the labium very highly specialized, should have been selected as representative of the Mecoptera is in line with the selection of the other specilaized labia. Much criticism is made of the work of Otanes. The labium of a species of *Panorpodes* (Fig. 10b), where the area which is homologous with the area in *Bittacus* homologized as the palpigers but which in reality is the prementum, shows the absurdity of the conclusions reached. In *Panorpodes* the so-called palpigers is a broad area without the slightest depression on the meson that might be homologized as the suture between the so-called palpigers. It was my privilege to study all the preparations used by Mr. Otanes in the preparation of his paper and to compare his drawings with his dissections. I am ready to vouch for the accuracy of the drawings, but especially to emphasize his conclusions regarding the absence of a longitudinal median suture dividing the area labelled as the palpigers by Dr. Crampton. That there is no such suture existing in any of the species studied by Mr. Otanes, I know from my own observations. I mistrust that Dr. Crampton and Mr. Otanes are not writing about the same cleft.

Dr. Crampton would like us to believe he has an incontrovertible series showing the origin of his palpigers in his figures 7 to 10. As I understand him, this series would go as follows: in *Bombus* the palpigers are elongate distinctly separated pieces; in *Rhipiphorus*, a beetle, "the palpigers become approximated mesally, and they comprise the greater portion of the region *pm*" (the prementum); in the neuropterid, *Nemoptera*, the palpigers have "become still more closely approximated mesally than they are in" *Rhipiphorus*, "thereby reducing the area between the palpigers;" while in the mecopteran *Bittacus*, "the

palpigers, *pgr*, unite basally, and the region *pm*, or prementum, is composed chiefly of the united palpigers."

Will the homology of the various parts sustain the series or is it simply an analogy in form? Let us examine it. The palpigers of *Bombus* and the honey-bee are identical in form and position and need no further discussion. In the beetle actual observation of specimens shows that in *Rhipiphorus* the palpigers are not adjacent on the meson and that there is an area beneath the palpigers, the so-called prementum or stipulae, just as can be identified in the labium of practically all beetles. The labium of *Nemoptera* I know only from Figure 9. Since the labium of *Rhipiphorus* (the homology of which as given by Dr. Crampton is not correct according to my view) is no longer a cog in this series, can one be blamed for doubting even the homology adopted for *Nemoptera*? In fact, I am unable to understand how any one could imagine that the palpigers could become fused to the surface of a sclerite, the prementum, and suppress it, so that the palpigers would become the connecting sclerite between the mentum and ligula, to use Dr. Crampton's nomenclature. This article does not actually say this is what has taken place, but his descriptions of labia certainly imply it. I believe that future studies of the labium of *Nemoptera* will show that the line marking the line of separation of the palpigers as shown in Figure 9 is either secondary or imaginary and that this entire structure, except the shoulders to which the labial palpi are attached, is the prementum of Crampton and the stipulae of Yuasa, Otanes, and MacGillivray.

The statement of Mr. Otanes as to the homology of the distal part of the labium in the Mecoptera, regardless of what Dr. Crampton writes, is very definite and as follows: "There is a subquadrate area distad or ventrad of the submentum which consists of the fused stipulae, palpigers, glossae, and paraglossae." The distal shoulder-like portions only as shown in Figures 10, 10a, 10b, and 10c, are the palpigers. The remainder represents the fusion of the parts named. It is possible for sutures to become obsolete, but this can not be said of sclerites. They always fuse. I believe, therefore, with Mr. Otanes, that what Dr. Crampton is designating as the prementum is not the same structure to which he has applied this term in the other labia he has figured and that Mr. Otanes was justified in introducing a new term, as he says, "This area is here designated as the mecaglossa, because it is typical of the Mecoptera." This sentence also explains why he used the term mecaglossa, meca from Mecoptera. Attention should also be called to the fact that the term prementum, Crampton, 1921, which is applied to an entirely different structure in all the figures from mecaglossa, is antedated by the term stipulae, Yuasa, 1920. I do not believe that priority should ever be followed in determining the

names of sclerites and sutures, because the interpretation of homologies is continually changing with more extended studies, and the nomenclature should be made to conform with our increase in knowledge of structures. The dates of the names cited above are only given that justice may be done.

That figure 11, the labium of *Empis*, looks to be a direct derivative from Figure 10, the labium of *Bittacus*, is very apparent. Peterson (Figs. 11a and 11b) studies and figures the labium of this same species and provides us with three figures. While we find no statement that the figure of Peterson is incorrect, yet Figure 11 does not show the central projection, *ag*, which is characteristic not only of *Empis* but of practically all the labia of Diptera that have been figured and which is shown by Peterson for this species. This central projection which is distinct even in this highly specialized dipteran, would certainly correspond to the ligula of Figure 9. It is the glossa of all modern writers, except Drs. Crampton and Tillyard, who have studied the labium of Diptera. Kellogg (Fig. 6) shows this central projection in *Rhyphus* as long as the lateral lobes or as three subequal lobes, a paraglossa on each side and a median glossae. Peterson is not alone in considering the labella as the homologues of the paraglossae of other insects. He has simply followed Kellogg and a host of other workers. Kellogg states the condition for the Nematocera, as follows: "Palpi are always wanting; no unmistakable indications of them are to be found, although in two forms examined, what may be palpal rudiments are present. The terminal lobes in freest conditions consist of the two free paraglossae sometimes apparently 2-segmented, and a median, always delicate, membranous lobe representing the fused glossae." We are indebted to Dr. Crampton for calling attention to one of the most interesting labia of any dipteran known or thus far figured, *Asyndulum montanum*, because it is so generalized. This is as might be expected one of the Nematocera, a Mycetophilidae. This labium is unknown to me other than through the figure of Dr. Crampton which offers the strongest possible evidence against his own contention that the paraglossae are the homologues of the labial palpi. The median projections of *Asyndulum* undoubtedly represent the separated glossae, a condition unknown to Kellogg, and eliminates the necessity for a special name, palpal lobes or palpilobi, for these structures.

Attention has been repeatedly called to the fact that the labia dealt with by Dr. Crampton are highly specialized products and belong to insects that are recognized by all as representatives of highly specialized groups. I have tried to show that when the generalized members of the orders Hymenoptera, Coleoptera (Fig. 3), Neuroptera, and Mecoptera (Fig. 10b) are studied, the homology of the parts of the labia of specialized insects of these

orders are easily determined. The same is equally true of the generalized Diptera. When one studies the labium of any of the Nematocera, they are so typical that no one would consider homologizing the lateral lobes as labial palpi, even though they consist of two segments or as other than what they actually are, the paraglossae. The fact that two drawings similar to those of *Bittacus* and *Empis*, look alike and are similar in appearance is no proof that they are identical in homology.

Phylogeny is based upon homology, and a correct homology can *never* be constructed by using the terminal highly specialized tips of lines of development. A correct homology can be determined only through a study of the generalized members of each order and the determination of the sequence of the modification of these structures by following through from the primitive generalized ancestor to the highly specialized condition; never by proceeding in the opposite direction. It is a well proven fact that with the simplification of structures, specialization by reduction, there is often a convergence in form between widely separated groups and as a rule this convergence in form has no bearing upon the homology of the parts concerned. Homology can never be determined through an analogy in form as Dr. Crampton has tried to do with the labium.

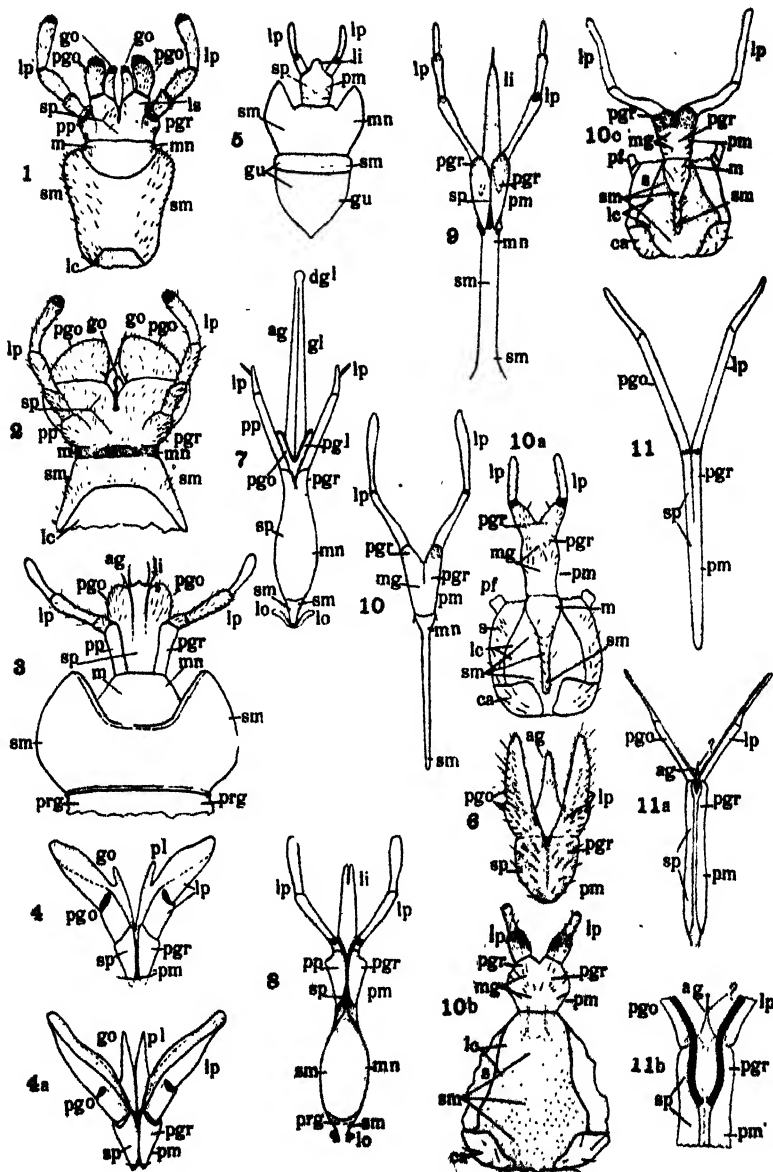
List of Abbreviations.

<i>ag</i>	alaglossa	<i>mn</i>	mentum
<i>ca</i>	cardo	<i>pf</i>	palpifers
<i>dgl</i>	distiglossa	<i>pgo</i>	paraglossa
<i>gl</i>	glossa	<i>pgr</i>	palpigers
<i>go</i>	glossa	<i>pl</i>	palpal lobes
<i>lc</i>	labacoria	<i>pm</i>	prementum
<i>li</i>	ligula	<i>pp.</i>	palpigers
<i>lo</i>	lora	<i>prg</i>	pregula
<i>lp</i>	labial palpi	<i>s</i>	stipes
<i>ls</i>	labiostipes	<i>sm</i>	submentum
<i>m</i>	mentum	<i>sp</i>	stipulae
<i>mg</i>	mecaglossa		

EXPLANATION OF PLATE 4.

Each figure bears two sets of labels, those of Dr. Crampton are placed on the right side while those on the left side represent my interpretation of the same parts.

- Fig. 1. *Blatta orientalis* (after Yuasa).
 Fig. 2. *Melanoplus differentialis* (after Yuasa).
 Fig. 3. *Harpalus caliginosus*.
 Fig. 4. *Asyndulum montanum* (after Crampton).
 Fig. 4a. *Asyndulum montanum* (after Crampton).
 Fig. 5. *Hydrophilus* sp. (after Crampton).



- Fig. 6. *Rhyphus* sp. (after Kellogg).
- Fig. 7. *Bombus* sp. (after Crampton).
- Fig. 8. *Rhipiphorus dimidiatus* (after Crampton).
- Fig. 9. *Nemoptera sinuata* (after Crampton).
- Fig. 10. *Bittacus* sp. (after Crampton).
- Fig. 10a. *Apterobittacus apterus* (after Otanes).
- Fig. 10b. *Panorpodes oregonensis* (after Otanes).
- Fig. 10c. *Bittacus strigosus* (after Otanes).
- Fig. 11. *Empis clausa* (after Crampton).
- Fig. 11a. *Empis clausa* (after Peterson).
- Fig. 11b. *Empis clausa* (after Peterson).

THE IDENTITY OF *SITOPHILUS* (CALANDRA) *RUGICOLLIS* CASEY (COLEOP.).

BY R. T. COTTON, *Entomologist, Stored Product Insect Investigations,
Bureau of Entomology.*

Thirty-two years ago Colonel Casey described the species *Calandra rugicollis* from a single specimen said to have been collected by F. Kinsel in southern Florida, and presented to Casey by W. Jülich. Since that time no further specimens of this species have been found in this country and its identity has remained unknown.

On comparing specimens of Marshall's *Calandra shoreae* with the type specimen of *C. rugicollis* Casey the writer finds that they are the same species. Marshall described *C. shoreae* in 1920 from India where he states it is common, breeding in the seeds of the sal tree (*Shorea robusta*) and in the seeds of *Dipterocarpus turbinatus*. This same species was also described in 1921 from Mauritius by Hustache who gave it the name of *C. rugosicollis*.

It does not seem probable that this species will turn up again in Florida unless it is accidentally introduced from India where it is undoubtedly indigenous. Unless it was incorrectly labelled, Casey's specimen was probably carried to Florida in seeds from India. The synonymy is as follows:

***Sitophilus rugicollis* Casey.**

Calandra rugicollis Casey Ann. N. Y. Acad. Sci. Aug., 1892, p. 287.

Calandra shoreae Marshall Bull. Ent. Research, Vol. xi, Pt. iii, 1920, pp. 276-277.

Calandra rugosicollis Hustache Ann. Soc. Ent. France. lxxxix, 1920 (1921) pp. 192-193.

NOTES ON THE MAXILLARY TEETH OF ANOPHELES.

BY RAYMOND C. SHANNON, U. S. Bureau of Entomology.

An examination of the maxillary teeth of *Anopheles maculipennis* Meigen was made, at the request of Dr. L. O. Howard, for the purpose of ascertaining whether teeth of this species varied in number in different regions of North America and how such differences correspond to the findings of Roubaud.¹ Roubaud has stated that in Europe *A. maculipennis* in malarial regions has an average of thirteen teeth and in regions where these mosquitoes feed exclusively on cattle the maxillae have an average of fifteen teeth, indicating also that in other non-malarial regions as many as eighteen teeth are found.

Material of *A. maculipennis* from California was supplied by Mr. S. B. Freeborn, Prof. Wm. B. Herms and Mr. P. G. Russell; from British Columbia by Mr. Eric Hearle and Mr. C. B. D. Garrett; and from Michigan by Dr. R. Matheson.

The variation in a series of nineteen specimens from Chico and Durham, near Chico, California, a notorious malarial region, covered the entire range of the number of teeth so far known for this species, thirteen to nineteen inclusive. Those from British Columbia numbered fifteen to twenty-one. It was found that the number of teeth varied in the same individual; in some instances, one maxilla would have a tooth or two more than the other. The increase or decrease may take place at either end of the row although it usually seems to take place within the row; the fewer the teeth the more widely separated they appear to be. In some cases one or more teeth would be very rudimentary. A magnification of 440 diameters had to be used in order to distinctly see the smaller teeth towards the tip.

The counts of the Durham specimens are: (1) 13-14; (1) 14-14; (4) 15-15; (2) 15-16; (2) 15-17; (1) 17-17; (1) 17-18. Average 15.4 teeth. The chico specimens gave counts of (1) 13-13; (2) 13-14; (1) 15 (one mx lacking); (1) 16-16; (1) 16-18; (1) 17-19. Average 15.15 teeth. Other California specimens as follows: Camarillo: (1) 15-17; (1) 16-17; Venturo: (1) 14-14; (1) 15 (one mx lacking); Santa Barbara: (1) 13-14; San Jacinto: (2) 13-13; (1) 14-15; (1) 16-16.

The Californian specimens range from 13-19; the average is 15.3. Considering the great and even variation shown in these specimens, mostly from the same region, it would appear that the practice of counting the teeth to ascertain whether the mosquitoes in this region prefer cattle to man and to determine their capacity for carrying malaria on this basis would be without much practical value. Moreover the average corresponds to that claimed by Roubaud to be characteristic for the race of *maculipennis* in France that feeds exclusively on cattle.

¹Bull. Soc. Path. Exot., Paris, xiv, pp. 577-595, 1921.

It is worthy of note that the number of maxillary teeth of *Anopheles maculipennis* seems to run consistently higher in the more northern and nonmalarial regions of North America. Seven specimens from Hatzie, British Columbia, ranged continuously from 15-18 teeth per mx; twenty-two from Oliver, British Columbia, had from 15-21 (4 maxillae had 21 teeth); three from Bessie Creek, Douglas Lake, Michigan, had 15-19 and one specimen from the heart of the Adirondack region, Buttermilk Falls, Rackett River, New York, had 17-18.

These give an average of 17.3 teeth per maxilla. This in a general way corresponds to Roubaud's statement, i. e. races of *A. maculipennis* which confine their attacks perhaps exclusively to cattle and horses (and probably other thick skinned hosts) have a higher number of teeth (fifteen in his statement) than those which choose man as their host. Roubaud evidently assumes that man was the original host of *A. maculipennis* and that the dentition averaged about 13 teeth per maxilla; but that this species is gradually coming to choose cattle as its host and under the influence of natural selection these mosquitoes are acquiring an increased number of maxillary teeth.

It is just as fair, on the other hand, and easier to believe that animals other than man were their original hosts and that the primitive number of teeth averaged higher. And in regions where man is now more numerous than other animals the mosquitoes are passively adapting their number of teeth to their thin skinned hosts. Furthermore it is possible to believe that in many regions the reason *A. maculipennis* prefers cattle to man is because cattle and other mammals, in the wild state, were their main source of food probably ages before man became sufficiently numerous to rival cattle as a source of food, and consequently they instinctively prefer cattle when both cattle and man are available.

Some miscellaneous counts on other species are appended.

A. quadrimaculatus Say (Stuttgart, Arkansas, Sept. 31, 1914) ten specimens showed counts very comparable to those of *maculipennis*, extending from 13-14 to 18-19; averaging 15.6 teeth per maxilla.

Counts made on *Anopheles punctipennis* Say (Plummers Island, Maryland, Dec. 25, 1923) show a rather consistent grouping around 15 and 16. The counts are (1) 13-14; (1) 14-15; (1) 15-15; (5) 15-16; (1) 15-17; (1) 16-17. Average 15.3.

Anopheles eiseni Coquillett, Canal Zone, Panama, showed counts of 13 and 14 teeth.

Anopheles (Coelodiazesis) barberi Coq., Plummers Island, Maryland, one specimen, had 11 and 12 teeth.

Counts made on a number of species of Sabethids ranged from 6-10.

THE PRESENCE OF AN EVERISIBLE GLAND IN A MIDGE.

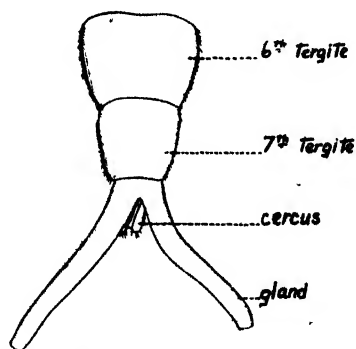
BY W. A. HOFFMAN, *Department of Medical Zoology, School of Hygiene and Public Health, Johns Hopkins University.*

Recently Mr. H. S. Barber of the National Museum turned over to me for identification, a ceratopogonine midge he had captured in a trap lantern June 11, 1921, at Plummers Island, Md. He called my attention to a paired structure projecting from the posterior region. The specimen proved to be a female *Palpomyia subasper* Coq. From all indications the structure is of glandular nature. It is extruded between the seventh and eighth tergites, and at its base equal in width to the latter. Slightly beyond the site of emergence a sharp divarication in the form of two long narrow tubular branches takes place.

A few measurements were made to give a comparative idea of the extent of the glands: length of body from base of antennae to tip of abdomen, 4.5 mm.; of abdomen, 3 mm.; sixth and seventh tergites combined, .9 mm.; of gland, 1.25 mm.

An examination of the collection of the National Museum and my own material failed to indicate a similar condition for other individuals of the species, or for any members of the subfamily. Apparently eversion resulted from the use of chemicals such as benzol, alcohol and xylol, which substances Mr. Barber has found serviceable in preventing contraction of an insect when placed in them in the order mentioned.

No literature thus far encountered mentions the existence of these organs in nematocerous Diptera. Dr. Riley of the University of Minnesota suggested that the structure might be placed in the same category as that of the repugnatorial glands, found so frequently in a number of insects. What its function may be, is of course problematical.



Dorsal view of posterior part of abdomen; about 22x.

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NEW SPECIES AND VARIETIES OF SPHENOPHORUS WITH
NOTES ON CERTAIN OTHER FORMS.

By F. H. CHITTENDEN, U. S. Bureau of Entomology.

The present paper includes descriptions of several distinctly new species and a larger number of variants, some of the latter so different from the typical species to which they are related that without a large series of specimens, it is difficult to indicate correctly their taxonomic status. The availability of considerable material has enabled a better understanding than could possibly have been obtained from a smaller series. While some of these variants are varieties only, there is indication that certain others may prove to be subspecies or geographical races. In most instances, in a good series for study, the variants here discussed are easily separable from specimens typical of the species.

Since the publication of the writer's five earlier papers on *Sphenophorus*, considerable knowledge has been obtained in regard to the distribution of the species of the genus and some of the outstanding forms are here mentioned mainly from the standpoint of geographical distribution.

Sphenophorus schwarzii, new species.

(Pl. 5, fig. 1.)

Form slender, nearly three times as long as wide, opaque black with porcelain-like gray natural covering on elytra and most of lower surface, including legs. Rostrum slender, seven-tenths the length of the prothorax; feebly arcuate in apical three-fourths, not constricted behind scrobes, extreme apex slightly produced posteriorly. Prothorax one-fourth longer than wide, moderately arcuate anteriorly, widest near middle; disc flat, opaque black; middle vitta a fine slightly elevated line extending from apex to base; lateral vittae polished black, narrow, of nearly uniform width, strongly elevated, extending from near apex nearly to base and enclosing with side margins, an elongate, flat, strongly declivous, oblong black area. Elytra one-fourth wider than prothorax, sides subparallel in basal half; scutellum subtriangular, sulcate at center; striae deep, closely, somewhat coarsely punctate. Intervals alternately finely, somewhat coarsely and closely punctulate. Pygidium gray-coated, sparsely variously punctate, much finer about margins. Prosternum with large shallow black disc-like punctures, confluent and sinuous. Meso- and metasternum and nearly entire abdomen densely covered with long golden-yellow hairs. First and second ventral segments slightly concave with thin impressed median line,

surface confluent coarsely punctate; fifth segment less coarsely and less closely punctate, punctures bearing long hairs. Legs long, femora and tibiae densely fimbriate with similar long yellow hairs. Third joint of tarsi strongly explanate forming a rounded brush as wide as long, spongy pubescent beneath.

Length, 12 mm.; width, 4.2 mm.; length of rostrum, ♂ 3.6 mm.

Fortress Monroe, Va., May 29, 1891, collected by Dr. E. A. Schwarz in whose honor the species is named.

Type ♂.—Cat. No. 26,900 U. S. National Museum. One specimen.

Not closely related to any known form but is allied to the *aequalis* group, because of the nature of the external coating and tarsal structure, the brush of the extremely wide third tarsal joint being widely separated medially. It differs noticeably in the slender nearly straight rostrum, flat pronotum with declivous sides and strongly villous lower surface and strongly fimbriate legs. This beautiful species is so distinct from all others of the genus known to the writer as nearly to warrant the erection of a new genus for its reception.

AEQUALIS GROUP

The following synopsis of the species and principal varieties is submitted:

Elytral striae moderately wide, with deep, rounded punctures.

Thoracic vittae indicated

Dorsal surface moderately punctate, nearly uniform, pale ocher, gray or pale bluish, E. U. S. to N. Dak. *aequalis*

Dorsal surface with black median line, Wash. var. *univitta* n. var.

Thoracic vittae distinctly elevated

Dorsal surface more strongly punctate, pale brown, Tex. var. *scirpi* n. var.

Elytral striae narrower, with punctures less rounded

Elytral striae punctures large and deep

Dorsal surface entirely black, Cal. *discolor*

Elytral striae punctures small and shallow; thoracic vittae black, elytra gray,

Ut., Cal., Wash. *ochreus*

Elytral striae very narrow, with punctures scarcely visible on disc.

Dorsal surface black, with abraded or subobsolete interspaces and alternate intervals partially gray, Cal. *pictus*

Sphenophorus aequalis univitta, new variety.

Dark, greasy-appearing gray, vertex, anterior face of femora largely, coxae, trochanters and middle of abdomen, shining black. Middle prothoracic vitta black in basal half, separated from lateral by large punctures. Scutellum black. Elytral striae coarsely and very closely punctate on disc. Anterior femora feebly, middle strongly villous.

Length: 12–16.5 mm.; width, 4.8–6.8 mm.; length of rostrum ♀ 3.5–4.5 mm.

Sprague, Wash., May 8, 1921 (M. L. Lane); Grand Coulee, Wash., July 8, 1902 (C. V. Piper).

Type ♀.—Cat. No. 26,899, U. S. National Museum.

***Sphenophorus aequalis scirpi*, new variety.**

Dull yellow brown on dorsal surface, paler brown to dull ochreous on sides and ventral surface; entire surface more strongly and densely punctate than in typical *aequalis*, especially noticeable on prothoracic interspaces, where some punctures tend to coalesce. Prothoracic vittae narrow, distinctly elevated, darker brown. Elytral striae punctures, very closely set, intervals finely punctate rather than punctulate as in other forms of this group.

♂—Ventral concavity somewhat shallow, strongly villous; last ventral segment also strongly villous.

♀—Similar to *aequalis*.

Victoria Co., Traylor's Lake, Tex. (J. D. Mitchell); McPherson, Kans. (J. K. McMillan).

Type ♀.—Cat. No. 26,908, U. S. National Museum.

Reared from corn and collected on *Scirpus* sp.

***Sphenophorus aequalis* Gyll.**

Aberration *a*—differs from the above in having very wide prothoracic vittae, which vary from dark brown to subopaque black.

Cameron Parish, La., May 10, 1919. Collected on corn.

***Sphenophorus ochreus* Leconte.**

Sphenophorus ochreus Leconte, Proc. Acad. Sci. Phila., 1858, p. 941; Chittenden, Proc. Ent. Soc., Wash., v. VII, p. 182, 1905.

In the writer's note on this species only Utah and Mexico were given as localities. It occurs at Salt Lake City and Provo, Utah; Volga, So. Dak.; Vallecito, Amedee, Cal., July 21, 4,200 ft. (Wickham); Paha, Wash., June 9 (M. L. Lane); Saskatoon, Saskatchewan (H. J. Atkinson).

***Sphenophorus ochreus atrivittata*, new variety.**

Elytral intervals 1, 3, 5, 7 and lateral all subopaque black, 2, 4, 6, and sub-lateral white, each with a single row of shallow, round, black punctures. Striae with small fusiform punctures, somewhat remotely placed. Ventral surface not villous. Sexual characters about as in normal *ochreus*.

The coloration imparts a strikingly black and white striped appearance. It is the most attractive *Sphenophorus* known to the writer, but is merely a color variant, as proved by a transitional individual and the apparent lack of definite specific structural characters.

Length, 14 mm.; width, 5.7 mm.; length of rostrum, ♂, 3.5 mm.

Utah (Coll. C. H. Roberts).

Type ♂.—Cat. No. 26,901 U. S. National Museum.

***Sphenophorus peninsularis nasutus*, new variety.**

Similar to typical *peninsularis*, differing chiefly as follows: Robust, nearly half as long as wide, with much less alutaceous natural coating. Rostrum ♀ only $\frac{3}{4}$ as long as prothorax, subequally dilated except at base, not suddenly recurved at apex. Prothorax nearly as wide as long; vittae wide, especially lateral, which have pronounced branch reaching base of prothorax; interspaces narrow, coarsely punctate. Elytra with distinct subapical callosity; intervals 1, 3, 5 and 8 elevated, 2 and 4 slightly so. Lower surface and sides below disc of thorax and elytra moderately shiny black, with little coating.

Length, 12.5–14.5 mm.; width, 5.8–6 mm.; length of rostrum ♀, 2.5–3.5 mm.

New York and vicinity (Wm. Juelich, Chas. Schaeffer); Mt. Pleasant, N. J. (E. G. Smyth).

Type ♀.—Cat. No. 26,907 U. S. National Museum.

The male is unknown. This variant evidently occupies a similar position in regard to the typical species as variety *intervallatus* to *setiger*.

***Sphenophorus setiger intervallatus*, new variety.**

This name is proposed for an interesting series in which the first five elytral intervals are long, wide and subequally elevated, imparting to the variant an appearance very similar to that of *ludovicianus*. It is even darker than that species. The abdominal brush of setae and other normal characters are present in the male, and the absence of other apparent structural differences between this and typical *setiger* are indicative of varietal rank only.

Anglesea, N. J., July and August; Plymouth, Woods Hole, Mass.; Texas; New York and vicinity.

Type ♀.—Cat. No. 26,909 U. S. National Museum.

***Sphenophorus laevigatus* Chittenden.**

Sphenophorus laevigatus Chittenden, Proc. Ent. Soc. Wash., v. VII, p. 58, 1905.

Comparison of a specimen from Winnipeg, Manitoba, collected by Professor Wickham, with the original description and type of this species from Utah shows no characters of separation. The same is true of two specimens labeled respectively "L. I." and "N. Y. City & vcty." The probabilities are that the last mentioned specimens are improperly labeled.

***Sphenophorus robustus rectistriatus*, new variety.**

Prothoracic interspaces and elytra with fine profuse pumbeous alutaceous coating. Elytral striae fine, thin, but quite distinct, straight, with very small, regularly somewhat distantly placed rounded punctures. Intervals nearly flat, subequal in width, third feebly elevated at extreme base.

Length, 12.0–13.5 mm.; width, 4.8–5.5 mm.; length of rostrum ♀, 4–4.5 mm.

New Buffalo, Mich., June, 1920 (M. H. Hatch); Indiana (J. B. Smith). Two females.

Type ♀.—Cat. No. 26,908 U. S. National Museum.

As there are all possible intergradations of this form and individuals with the extreme scarcely punctate elytra of *robustus*, it is evidently a variety only of that exceedingly variable species as regards elytral sculpture.

***Sphenophorus blatchleyi*, new species.**

Body a little more than three-tenths as wide as long; opaque black, surface with very little dark alutaceous coating. Head obsoletely punctulate. Rostrum (♀) about two-thirds as long as prothorax, feebly nearly uniformly arcuate, very little compressed at base, not at all at apex; base feebly widened with subparallel sides, not protuberant; interocular puncture minute but distinct, surface of rostrum finely punctate and punctulate. Prothorax distinctly longer than wide, vittae similar to *zeae*, interspaces rugosely, less densely punctate. Elytra very little wider than prothorax; striae thin, irregular, with very large, irregular, mostly rugosely excavate, closely-placed punctures; intervals very narrow and very irregular bi- and uniseriately punctulate. Ventral surface coarsely variolately punctate, scarcely finer on apical end of middle of first abdominal segment. Tarsi subequal in width, third tarsal joint of the anterior legs little wider than the other two.

Length, 9.0 mm.; width, 3.3 mm.; length rostrum ♀, 2.2 mm.

Ormond, Fla., April 3, 1911 (W. S. Blatchley), one female.

Type ♀.—Cat. No. 26894 U. S. National Museum.

Named in honor of Prof. W. S. Blatchley. Similar in general appearance to *zeae* Walsh, from which it differs markedly in the structure of the rostrum, in particular in the lack of the basal protuberance, the much coarser and shallower elytral punctures, the more densely punctate lower surface and the narrower third joint of the anterior tarsi.

***Sphenophorus serratipes*, new species.**

(Pl. 6, fig. 4.)

Dorsal surface similar to *ulkei*, more slender, about three-eighths as wide as long, black, subopaque on dorsum, moderately shining on ventral surface; antennae mostly, tarsi entirely piceous. Rostrum two-thirds as long as prothorax, nearly straight, somewhat widely and uniformly compressed, moderately dilated at base, not strongly over scrobes; surface somewhat coarsely, densely punctate, at base more strongly and densely, not canaliculate and without impressed line, interocular depression feebly defined. Prothorax ♂ about three-fifths as wide as long, sides subparallel, apical constriction strong, surface nearly uniformly deeply densely punctate without apical fossa but with a narrow median smooth line, each side of which are two slight depressions in basal third. Scutellum sulcate at middle. Elytra one-fourth wider than prothorax; striae fine, much interrupted by large shallow foveae; intervals alternate in convexity, sutural and third subcarinate, biseriately, remainder uniseriately punctulate. First and second abdominal segments somewhat deeply, sparsely punctate; third and fourth short, finely remotely punctate; fifth deeply closely punctate at middle.

Tibiae strongly, more or less irregularly serrate on inner face, neither tibiae nor tarsi fimbriate. Third joint tarsi scarcely wider ($\frac{1}{2}$ — $\frac{1}{4}$) than first in all pairs.

♂—Pygidium subtruncate at apex. Ventral concavity moderately wide and somewhat shallow.

♀—Pygidium normal, feebly concave each side.

Length, 8.4 mm.; width, 3.0 mm.; length of rostrum, 2.2 mm.

Fort Collins, Colo., May 22, 1898 (Wickham); Medicine Hat, Alberta, Can. (F. S. Carr).

Type ♂.—Cat. No. 26,896 U. S. National Museum; paratypes also in the National collection at Ottawa, Canada; and in the collection of L. L. Buchanan.

The roughly serrate inner margin of the tibiae is evidently peculiar to this species, and this character, together with the long nearly straight equally compressed rostrum distinguish it from all others described from North America. It is closely related to *ulkei*, evidently replacing that species in the extreme North.

***Sphenophorus cicatristriatus* Fähræus.**

Sphenophorus cicatristriatus Fähræus, In Schönh. Gen. Curc. v. IV, p. 958, 1837.

Sphenophorus cicatripennis Fähr. op. cit. v. VIII, 2, p. 262; Chevrolat, Ann. Soc.

Ent. Fr. 1885, pp. 110, 111; Champion, Biol. Cent. Amer., Coleoptera, v. IV, pt. 7, p. 159, 1910.

Among a series of specimens submitted to Mr. G. C. Champion, both this species and *ulkei* were returned with the statement that they were identical. Three of these specimens indicate readily by the habitus that they are distinct from the latter. *S. cicatripennis*, according to Champion, was based upon examples with "a comparatively smooth prothorax, fewer foveae on the elytra, and the depressions of the surface 'pulverulent.'"

The prothorax, with the exception of the medio-scutellar portion which is deeply punctate and not divided as in *ulkei*, has the appearance of having been smoothed by artificial means, or by rubbing consequent to age, and the striae punctures are smaller, regularly and uniformly horse-shoe-shaped and more distantly placed on the disk in the basal portion. The prothorax is also longer with subparallel sides, and with distinct but small foveae in the medio-basal region, and there is one additional character which absolutely separates this species from *ulkei*. The head and rostrum are very feebly punctate, whereas in *ulkei* there are well defined, closely placed punctures. The third joint of the anterior tarsi is fully twice as wide as the second joint, whereas in *ulkei* the third joint is scarcely one-third wider than the second.

Specimens examined by Mr. Champion and the writer are from the State of Mexico, Mex. The writer also has examined

specimens from Atzacapotzaco, Mex., collected by Mr. E. G. Smyth, which are entirely lacking the pulverulence discussed by Fahreæus, the entire surface being polished black.

***Sphenophorus jugosus*, new species.**

(Pl. 6, fig. 1.)

Slender, black, opaque on dorsal surface, feebly shining on ventral, with portions of antennae, tarsi and apices of elytra piceous; no visible natural coating.

Rostrum ♀ four-fifths as long as prothorax, slender, moderately arcuate and compressed from apical fourth gradually stronger to apex; base and apex about equally compressed; base moderately protuberant, moderately dilated, sides subparallel, subvariately punctate in basal half, more coarsely at base and on vertex of head. Prothorax (without apical constriction) not longer than wide, feebly bisinuate at base, somewhat indistinctly vittate, median vitta indicated by an irregular longitudinal area, broadest near middle, extending from apex, where elevated as on disc, a little beyond middle; lateral vittae represented by broad areas extending from base to beyond middle, these three areas scarcely elevated with few very small punctures; interspaces with few large coarse shallow variolate punctures, smaller at sides and still smaller apically. Scutellum short, triangular, deeply concave at base. Elytral surface uneven, with 7 strong transverse elevated ridges each side of third interval; striae fine, interrupted by moderate-sized deep irregularly rounded punctures; intervals feebly and remotely punctulate; 1 narrower than 2; 3 nearly as wide as 1 and 2 together, elevated and shining near middle; 5 slightly elevated. Apical tubercles prominent, humeri not prominent. Pygidium densely deeply punctate, convex, vestiture sparse, pale yellow with small apical tufts. Ventral surface sparsely coarsely punctate, punctures shallow, foveate on metasternum; first and second abdominal segment (♀) separated by well defined sutural line. Femora slender, with somewhat coarse shallow punctures. Tibiae slender, straight on outer face, obliquely truncate; anterior with outer face rounded and apical spur as long as width of tibiae, acute. Third joint of anterior tarsi little wider than second.

Length: 7.5 mm.; width, 2.8 mm.; length of rostrum ♀ 2.0 mm.

Type ♀.—Cat. No. 26,892 U. S. National Museum.

This species appears to be most nearly related to *destructor* and *callosus*, but has a longer and more slender rostrum, more slender femora and tibiae, has no natural coating and different punctuation.

***Sphenophorus incongruus elephantulus*, new variety.**

More robust throughout than typical *incongruus*, black, moderately shiny with pale gray alutaceous coating between and at sides of prothoracic vittae and on alternate intervals. Rostrum $\frac{5}{8}$ as long as prothorax, somewhat robust. Prothorax only $\frac{1}{2}$ longer than wide, arcuate at sides; vittae wide; interspaces coarsely subvariately punctate. Legs somewhat stouter than typical.

Length, 10 mm.; width, 3.5 mm.; length of rostrum ♀, 2.5 mm.

Western Kansas (E. A. Popenoe). A donation from Mr. C. H. Popenoe.

Type ♀.—Cat. No. 26,905 U. S. National Museum.

***Sphenophorus robustior costifer*, new variety.**

Body more slender than in typical *robustior*, more than two-fifths as long as wide. Prothorax shorter, as wide as long; vittae polished black, nearly covering the disc; interspaces very narrow, alutaceous. Elytra feebly alutaceous; intervals 1, 3, and 5 strongly elevated, shining. The existence of one individual intermediate between the variety type and typical *robustior* indicates that this form is not entitled to specific rank.

Length, 11.2 mm.; width, 4.3 mm.; length of rostrum ♀, 3.0 mm.

South Dakota (J. M. Aldrich); Lake Okoboji, Ia., June 21, 1917 (L. L. Buchanan).

Type ♀.—Cat. No. 26,895, U. S. National Museum.

***Sphenophorus sublaevis* Chittenden.**

(Pl. 5, fig. 2.)

Sphenophorus sublaevis Chittenden, L. c., p. 176.

In Blatchley and Leng's *Rhynchophora* (p. 568) *sublaevis* is assigned as a variety of *callosus*. The differences are shown by the accompanying illustrations of both species and of *destructor*. Indeed, this form is intermediate between *callosus* and *destructor* and more nearly related to the latter. In the series which has been studied, the elytra are always strongly transversely and irregularly rugose. The ground color is black with a strong tendency to smoothness. One individual has certain portions of the dorsum shining black. *S. callosus* is always dull opaque.

This species is somewhat more northern in distribution than *destructor* but specimens of both have been seen from regions not far remote from each other.

***Sphenophorus venatus* Say.**

Sphenophorus vestitus Chittn., Proc. Ent. Soc. Wash., v. VI, 1904, p. 134.

Additional experience in the study of the genus since the description of this species was made, together with the accession of a series of two specimens from Tappahannock, Va., July 20, 1916 (H. Fox) and one from Smith Island, Va., the last from the stomach of a toad, has convinced the writer that *vestitus* is simply a smooth gray-coated variation of *venatus*, not entitled even to a varietal name. Similar instances of smooth-coated specimens, in some cases, at least, newly developed, are not rare in the genus and are especially exemplified by *callosus* and *cariosus*.

Sphenophorus holosericus, new species.

(Pl. 6, fig. 2.)

Body ♀ robust, about two and one-eighth times as long as wide; opaque velvety black, inner surface of femora, knees, and tibiae shining black; no natural coating. Rostrum ♀ a little less than three-fourths as long as prothorax, strongly compressed, strongly protuberant over scrobes, moderately very irregularly arcuate; base deeply irregularly confluent punctate; interocular puncture small, deep, without impressed line, succeeding punctation arranged in somewhat irregular rows, gradually finer toward apex; feebly arcuate, nearly straight in middle half, strongly reflexed posteriorly at apical fifth, where it is widened about as over scrobes, outer face of apex strongly concave, inner face acutely produced at extreme apex. Prothorax about one-fourth wider than long, somewhat feebly convex on disk, surface deeply punctate at apex, densely at sides, more sparsely elsewhere, punctures confluent at sides of a thin smooth median area, and near base. Scutellum small, about twice as long as wide, nearly flat, declivous at extreme base. Elytra short, about four-fifths as wide as long, deeply narrowly striate, irregularly somewhat coarsely and sparsely punctate, punctures very distantly set; intervals subequal in width; third much wider, scarcely elevated, bi- and triseriately punctulate basally, others uniseriately. Ventral surface sparsely, somewhat finely and not deeply punctate. Legs finely and distinctly punctate. Anterior and posterior femora glabrous, middle pair slightly villous on inner surface. Tibiae slender, somewhat strongly angular on inner surface above middle, feebly serrate and villous; outer angle sinuous, at apex slightly produced, inner angle with a strong acute spur, and a shorter subapical spur, about one-fourth as long as apical one. All tarsi narrow, subequal in width.

♂—More slender than ♀. Ventral concavity shallow. Pygidium very small strongly rounded near apex.

♀—Rostrum slightly longer and more strongly compressed. Third elytral interval slightly widest, biseriately punctulate near base. Pygidium small, distinctly arcuate at apex, surface deeply sparsely punctate.

Length ♂, 7.0-8.5 mm.; width, 2.4-4.0 mm. Length ♀, 7.5 mm.; width, 3.0 mm. Length rostrum ♀, 2.6-2.8 mm.; of ♂, 1.8-2.2 mm.

Willis, Tex. (J. C. Bridwell); Columbus, Tex., June 25 (Hubbard and Schwarz); Victoria, Tex. (W. E. Hinds); Longview, Tex.; Arizona (H. K. Morrison).

Type ♀.—Cat. No. 26,893 U. S. National Museum.

This species bears no especial resemblance to any other in our fauna. The rostrum recalls that of *zeae*, is more coarsely punctate at base, while in the latter the median carina is lacking. The thoracic and elytral sculpture is peculiar, similar to *arizonensis*, in which, however, the punctures are smaller and rounded, and *deficiens* where they are partially oval and in part rounded, but more closely placed in rows. The type is larger, more robust and shows the specific characters much more clearly than the remainder, which are apparently dwarfed, especially the

males. In two males examined there is a finely impressed line below, but not continuous with, the interocular puncture.

***Sphenophorus reticulatus*, new species.**

Form similar to *ulkei*, opaque dull black. Prothorax more coarsely punctate, elytral sculpture finer, anterior tibiae obliquely truncate. Rostrum ♀ a little more compressed on apical third. Prothorax with a distinct median carina over half as long as prothorax, each side of which in basal half is a moderately deep, long fossa; surface more deeply, coarsely and densely reticulately punctate, without smoother spaces in usual location of lateral vittae, punctures confluent in submedian fossae and at sides posteriorly. Scutellum flat or slightly concave, feebly shining. Elytra finely striate, striae interrupted by much shallower contiguous and confluent foveae; intervals extremely narrow, scarcely wider than lines, subequal in width, 3, 5 and 7 more prominent, narrowly costate or subcostate, first or sutural and third biserially, others uniserially punctulate. Ventral surface more coarsely punctate than in *ulkei*, and more densely on last segment. All tibiae obliquely truncate, not visibly produced exteriorly.

♂—Metasternum deeply and narrowly concave through middle, concavity twice as long as wide and very coarsely punctate.

♀—Metasternum moderately and narrowly concave, less coarsely punctate. Length, 9–10 mm.; width, 3.6–4.0 mm.; length ♂ and ♀ rostrum 2.0 mm.

Arizona, 1 ♂, 1 ♀.

Type ♀.—Cat. No. 26,897 U. S. National Museum.

In the male specimen the prominent intervals are much more narrowly costate, an individual, not a sexual, difference.

***Sphenophorus bartramiae*, new species.**

(Pl. 6, Fig. 3.)

Black; surface except eyes, apical portion of rostrum and antennae, almost completely covered with a thick yellow-brown more or less natural felt-like coating to which argillaceous material adheres obscuring the punctation, striae and sculpture. Rostrum ♀ short, thick, one-fourth as long as prothorax moderately arcuate, narrower in middle third, dilated at apex. Prothorax subquadrate, wider than elytra except at base of latter, nearly as wide apically as at base, location of vittae and foveae faintly indicated, punctation fine and sparse. A minute median subapical callosity and a similar lateral sub-basal one, near basal angle of prothorax. Elytra strongly acuminate posteriorly forming an isosceles triangle; intervals subequal in width and height, finely uniserially punctate. Lower surface finely and sparsely punctate. Legs and other characters not mentioned, similar to *minimus*.

♂—Pygidium wider and subtruncate at apex; first two ventral segments very feebly concave at middle.

♀—Pygidium narrow and rounded at apex with fine hairs; first two ventral segments subconnate.

Length, 6.5–8 mm.; width 2.8–3.2 mm. Length of rostrum ♀, 2 mm.; of ♂ 1.6 mm.

Victoria, Tex., March 28, 1907 (W. J. McAtee). Specimens taken from the crop of *Bartramia longicauda*, the upland plover.¹

Type ♀.—Cat. No. 26,904 U. S. National Museum.

This species, while quite distinct, bears some resemblance to the related *minimus* but is much larger. The superficial characters alone separate it readily from any described form. In some individuals the elytra bear a subapical callosity on a distinct tubercle. In only one specimen examined is the character of the elytral punctation visible. Considerable individual variation is apparent even in a small series from a single locality. In most specimens the location of the striae is indicated by a few fine short jet black lines.

***Sphenophorus necydaloides* Fabricius.**

Calandra necydaloides Fabricius, Systema Eleutheratorum, vol. VII, p. 435, No. 29, 1801; Olivier, Histoire Naturelle des Insectes, Paris, 1807, vol. V, No. 83, p. 94, Pl. 28, fig. 420.

Sphenophorus retusus Gyllenhal, Schoenherr, Gen. et Spec. Curculionidum v. IV, p. 949, 1837, Horn, Proc. Amer. Philos. Soc., 1873, pp. 427, 428.

The original description of Fabricius is briefly as follows:

"Statura omnino *C. abbreviatae*, at distincta et alia. Caput atrum, nitidum, rostro incurvo. Thorax niger, obscurus, vix punctatus. Elytra abdomine breviora, striato-punctata."

Olivier's description is in substance:

"Obscure black with a tendency to cinereous; thorax feebly punctate with the middle smooth. Elytra little shorter than the abdomen; striae feebly punctate."

The length of the species (*S. abbreviatus*) with which it is compared, and the hair-line of Olivier's figure is between 9 and 10 mm., the locality "Carolina." The original description is as recognizable as that of *melanocephalus*, and Olivier's interpretation of the latter with the accompanying figure is generally accepted. The illustration furnished by Olivier of *necydaloides*, together with his description, size, and locality, leave little doubt that that species is the same as *retusus* Gyll.

***Sphenophorus chittendeni* Blatchley.**

Sphenophorus chittendeni Blatchley, Rhynch. N. E. Am., 1916, p. 565

A specimen from Eaugallie, Fla., January 8, 1910, from the

¹It is of interest that the upland plover feeds upon *Sphenophorus* to a considerable extent, the list of species including *germari*, *oblitus*, *compressirostris*, *costipennis*, *parvulus*, *venatus*, and several other weevils, some injurious.

stomach of *Sturnella granella*, also a specimen reported by Mr. L. L. Buchanan from Quitman, Ga., in stomach of a toad.

***Sphenophorus oblitus* Leconte.**

Sphenophorus oblitus Lec., in Leconte & Horn, Rhynch. Am. No. of Mex., Proc. Am. Phil. Soc., v. XV, 1876, p. 425.

Widely distributed in Texas; also Shreveport, La., Montgomery, Ala. (H. Soltau); Duncan, Okla. (T. D. Urbahns); Rocky Ford, Colo. (H. O. Marsh); Rooks Co., Kansas; Arizona (H. K. Morrison).

Reported to be injurious to rice.

***Sphenophorus tardus* Fall.**

Sphenophorus tardus Fall, Cal. Acad. Sci., v. VIII, 1901, p. 269, 270.

A single specimen from Willcox, Ariz., collected by Dr. A. K. Fisher. Previously known only from California.

***Sphenophorus germari pinguis*, new variety.**

Similar to typical *germari*, shorter, more robust, twice as long as wide; elytra short, little longer and scarcely wider than prothorax. Dorsal surface opaque with many depressions and other inequalities, striae of elytra deeper, especially toward the apex where the punctures become more elongate and smaller. Anterior tibiae moderately angulate below the middle, nearer the apex than in *germari*.

Length, 8.0 mm.; width, 4.0 mm.; length of rostrum, 2.2 mm.

Tampa, Fla., April 15 (Hubbard and Schwarz).

Type ♂.—Cat. No. 26,906 U. S. National Museum.

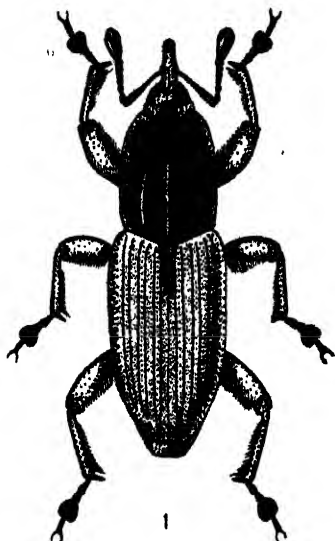
This may prove a distinct species, the last character alone being significant together with the habitus and the other characters mentioned. A larger series is desirable to establish or disprove this.

***Sphenophorus compressirostris obscuripennis*, new variety.**

A digression from the common type is deserving mention, and there is indication that it merits recognition as a race. The principal distinguishing characters of normal *compressirostris*¹ are as follows:

Thorax opaque with vittae moderately distinct or indicated and moderately shining. Elytral intervals strongly alternately convex, alutaceous and usually more or less coated with argillaceous material, sculpture and punctuation more or less obscure—Tex., Kans.

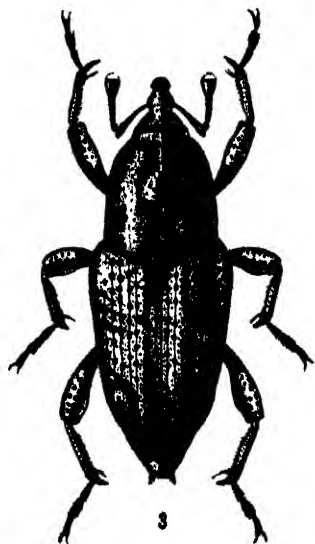
¹Jour. Acad. Sci., 1823, p. 319; Lec. ed. v. I, p. 20; Horn, Proc. Am. Phil. Soc. 1873, p. 429.



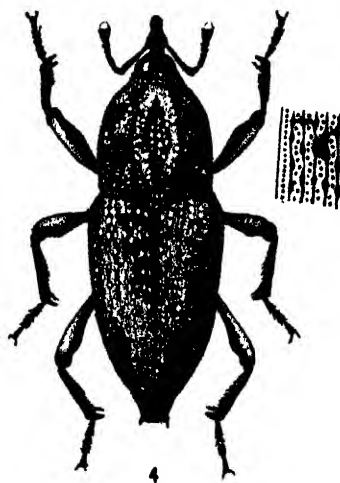
Sphenophorus schwarzii



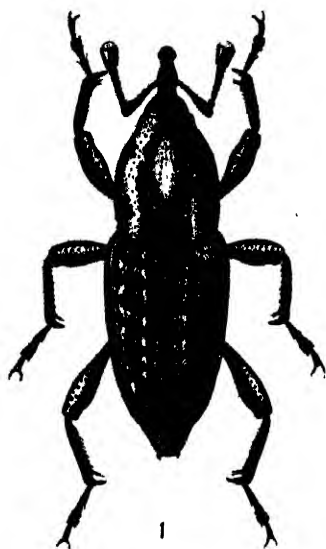
Sphenophorus sublaevis



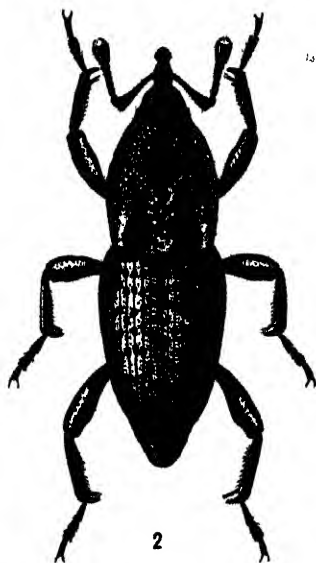
Sphenophorus callosus



Sphenophorus destructor



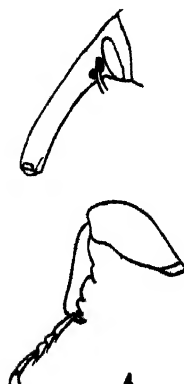
Sphenophorus jugosus



Sphenophorus holosericus



Sphenophorus bartramiae



Sphenophorus serratipes

Variety *obscuripennis* differs mainly as follows:

Thorax largely shining black on disc, sparsely punctulate except at sides and each side of median line near base. Elytral sculpture almost obscured by thick gray coating, intervals feebly indicated. Tooth of anterior tibiae very strongly developed.

Texas: Edinburg (Coll. Chhtn.), Beeville and Sharpsburg (Hubb. & Sz.) Brownsville (Wickham), Koehler, N. Mex. (E. R. Kalmback).

Type ♀.—Cat. No. 26,903, U. S. National Museum; paratype Canadian National Collection.

The habitat of *obscuripennis* is extreme southern Texas and doubtless extends into Mexico.

Few specimens of typical *compressirostris* have been seen with no argillaceous coating, something that is to be noticed, however, in other species, e. g., *cariosus*.

EXPLANATION OF PLATE 5.

Fig. 1, *Sphenophorus schwarzi*

Fig. 2, *Sphenophorus sublaevis*

Fig. 3, *Sphenophorus callosus*

Fig. 4, *Sphenophorus destructor*

EXPLANATION OF PLATE 6.

Fig. 1, *Sphenophorus jugosus*

Fig. 2, *Sphenophorus holosericus*

Fig. 3, *Sphenophorus bartramiae*

Fig. 4, *Sphenophorus serratipes*: Rostrum and anterior tibia.

NEW BETHYLID AND SERPHOID PARASITES FROM NORTH AMERICA. (HYMENOPTERA.)

By ROBERT M. FOUTS.

This paper contains descriptions of eleven new species and one new genus of Hymenoptera belonging to the families Bethyliidae, Scelionidae, Calliceratidae and Diapriidae.

All measurements recorded were made with a Bausch and Lomb binocular microscope, 24 mm. objective, No. 5 ocular and a micrometer disc ruled to five mm. in .05 mm. divisions. Each division equals .0111 mm.

I take as the width of the thorax the length of a line drawn from the outside edge of one tegula to the outside edge of the other. In computing the height of the thorax an imaginary line is drawn from the middle of the mesonotum above to that part of the sternum just in front of the middle coxae below. When speaking of the length of the head I mean its greatest length, not back to the foramen magnum but to the apices of

the lateral lobes. The "proportion" discussed several places in this paper is obtained by dividing the width of the head by the length of the thorax and multiplying the result by the length of the second tergite.

Unless otherwise mentioned the type material described below is in the author's collection.

Family BETHYLIDAE.

Psilodryinus carinatus, new species.

Female.—Length 4 mm. Runs to section 4 in Kieffer's key (Das Tierreich, Lief. 41, 1914, p. 54), and differs from *sumatranus* in having the abdomen dark. From *acuticollis* (ibid., p. 56), it differs more particularly in having the basal nervure about as long as the nervulus, and in having the first tarsal joint of the anterior leg a little over twice as long as the second and third united. The species may be distinguished from *thoracicus* (Fouts, Philippine Journ. of Science, vol. 20, 1922, p. 632), by having a small subbasal tooth on the outer claw and by having the fourth joint of the anterior tarsus only slightly longer than the second and third united.

Scape very little longer than the second joint, the latter twice as long as thick; prothorax a little longer than the combined lengths of the mesonotum and scutellum; scutellum separated from the mesonotum by a transverse depression, the latter partitioned eight times longitudinally; propodeum with many more or less straight and parallel longitudinal ridges, the intervals twice as wide as the ridges and crossed frequently and indiscriminately by other ridges or carinae; wings rounded distally, the outer brown band extending below to the brachius; third joint of anterior tarsus three times as long as the second; fourth joint a little more than half as long as the first; outer claw of chela reaching nearly to the base of the inner one, with a minute tooth subapically and also with an equally small one basally; inner claw attached to the fourth joint at its apical one-fifth. Coloration of the legs as in *thoracicus* Fouts.

Occurs at Carlisle, Pennsylvania. (Robert Fouts, July 21, 1920, one specimen.)

A correction should be made in the author's paper referred to above (Fouts, 1922, p. 632.) On the second line at the top of the page for "posterior" read "anterior."

Family SCELIONIDAE.

Hoplogryon similis, new species.

Female.—Length 1.00 mm. Closely related to *crassicornis* Kieffer. The fourth tergite is faintly reticulated basally and this character serves to distinguish the species. *H. crassicornis* has the tergites following the third bare and shining. Kieffer's description (Berl. Ent. Zeit., vol. 50, p. 262), with the exception noted above and one other, noted below, fits the present species very well. The author has, however, omitted the discussion of several characters of interest. These are as follows: thorax as wide as long, finely and rather densely pubescent above, bare laterally and below; abdomen as wide as the thorax; its length is

to its width as five is to three; second tergite provided with about a dozen deep longitudinal grooves extending to a little past its middle; there is nothing suggesting raised carinae as is the case in *longipennis* of Ashmead; the length of the anterior wing is to the length of the abdomen as eight is to five. The very short radius is situated slightly anterior to the apical third of the wing.

Occurs at Ames, Iowa. (Phillip Spong, January 20, and February 19, 1923, three specimens.) Type and paratype in collection U. S. N. M., Cat. No. 26833. Paratype in collection Fouts.

***Leptacis obscuricornis*, new species.**

Female.—Length 1.55 mm. Related to *americanus* Ashmead from which species it differs in having the fourth antennal joint shorter than the pedicel. Head less than twice as wide as long, deep behind the eyes, the cheeks wide, oblique; frons, vertex and occiput faintly reticulate; antennae rather stout; pedicel longer than the fourth joint, the latter longer than the third; fifth joint about half as long as the fourth, a little longer than the sixth; seventh joint wider than the pedicel, twice as wide as the fourth joint, longer than wide; eighth joint shorter, a trifle wider than long; ninth still shorter, as wide as the eighth; tenth a little longer than the seventh, not quite twice as long as wide, blunt apically; thorax smooth and shining, without sculpture, sparsely pubescent; notauli absent; scutellum hump-like basally, its dorsal surface considerably higher than that of the mesonotum; spine extending to the apex of the propodeum, far above it, however, its apex sharply pointed; length of thorax 55, width 33, height 38; abdomen a little longer than the thorax, not quite twice as long as wide, without sculpture of any sort; the length of the second tergite is to its width as four is to three; base of scape yellowish; legs brownish, the coxae, femora and tibiae, apically, darker; tarsi and tibiae (except at apex), yellow.

Occurs at Ames, Iowa. (Phillip Spong, November 25, 1922, two specimens.) Type in collection U. S. N. M., Cat. No. 26834. Paratype in collection Fouts.

Family CALICERATIDAE.

***Calliceras pallidipes*, new species.**

Female.—Length .79 mm. Differs from description of *fusciceps* (Ashmead, Monogr. Proct., p. 125) as follows: head uniformly dark brown; ninth antennal joint slightly wider than long, tenth a little over three times as long as the ninth.

Apterous; head finely reticulate; mandibles and that part of head around mouth pale yellow; scape, pedicel, legs, thorax (except propodeum) and abdomen (except apical half dorsally and laterally), pale yellow; flagellum dark brown, gradually incrassated, the last joint acute, a trifle over three times as long as wide; abdomen one and one-half times as long as wide, a little longer than the head and thorax united, finely striate at base.

Occurs at Glen Echo, Maryland. (Robert Fouts, July 11, 1923, one specimen.)

Calliceras fasciata, new species.

Female.—Length .854 mm. Runs in Kieffer's key (Das Tierreich, Lief. 42, 1914, p. 79), to *pallidiventris* Ashmead. The pedicel in *fasciata* is about twice as long as the third antennal joint. (See Ashmead Monogr. Proct., p. 126.) Head, thorax and greater part of abdomen dark amber-colored; scape and legs yellow; pedicel somewhat darker; flagellum piceous; abdomen below yellow, laterally yellow to reddish yellow. Thorax and head finely and rather closely covered with short decumbent white hairs; length of head 15, width 25, height 24; pedicel about as thick as the fifth joint; joints three and four equal, as long as wide; five wider, transverse, a little longer than the fourth; six slightly longer and wider than five; seven wider, as wide as eighth but somewhat shorter; eighth and nine subequal, nearly twice as wide as long, as wide as ten; ten about as long as eight and nine united, conical, acute apically; length of thorax 27, width 21, height 23; median line on mesonotum faintly impressed; length of abdomen 35, width 20, height 21; length of second tergite 24; wings with a more or less distinct fascia medially; radius bow-shaped, shorter than the marginal vein, a little more than its own length distant from the apex of the wing.

Occurs at Glen Echo, Maryland. (Robert Fouts, August 21, 1917, two specimens.) Paratype in collection U. S. N. M., Cat. No. 26835. Type in collection Fouts.

Family DIAPRIIDAE.

CRACINOPRIA, new genus.

Runs to *Ashmeadopria* in Kieffer's key (Das Tierreich, Lief. 44, 1916, p. 11), and differs from that genus in having lateral processes on the propodeum and in not having a median carina on the propodeum which appears triangular when viewed from the side. Also the marginal vein is not obviously cuniform.

Head transverse, the rather prominent frontal ledge causing it to appear globose, smooth and shining, as is the entire body; frontal ledge rounded or emarginate above (in those species having the latter character the free plate part is much less in evidence and the depression behind becomes shallow and inconspicuous, without a longitudinal carina (*crassicornis* and *emarginata*); face below ledge flattened, smooth; clypeus truncate apically; antenna (in female) rather stout, 12-jointed; joints 4-9 of about equal width, transverse (or at least not longer than wide); terminal three joints forming a club (sometimes distinguished more by the lengths of its several members than by their widths); antennae (in male) rather long, 14-jointed, filiform, and covered with short hairs; fourth joint enlarged toward the apex, longer than joint three, sometimes deeply emarginate below; joints 7-13 moniliform; eyes rather small, oval, bare (eyes larger and apparently with a few scattered hairs in *emarginata*); mandibles bidentate, the lower tooth slightly the longer (not observed in *marylandica*); thorax less than twice as long as wide, about as wide as high, more than half as long as the abdomen, narrower than the head (except in *emarginata*); thorax polished, without sculpture except on the propodeum; pronotum visible from above, with rounded angles (except in *marylandica* and in *perplexa*, the

latter species having these parts particularly bluntly angulate); mesonotum transverse, with traces of notauli; scutellum with a median longitudinal ridge (*emarginata* and *crassicornis*) or with an indication of such a ridge posteriorly; metapleura and propodeum laterally pubescent; propodeum short, produced posteriorly on each side into a linguiform process; these processes pubescent laterally (except in *perplexa* and *marylandica*); the upper face of the propodeum is very short (*marylandica*) or practically absent, only the inclined posterior face being present; abdomen less than twice as long as the thorax, wider than the head or thorax, twice as long as wide (*crassicornis*) or less than twice as long as wide; wings ciliate marginally, in *emarginata* slightly longer than the combined lengths of the head, thorax and abdomen; marginal vein short, truncate apically, situated (in *emarginata*) at one-fourth of the wing's length from the tegula.

Genotype.—*Trichopria marylandica* Fouts.

Table to Species.

- | | |
|--|------------------------------------|
| 1. Frontal ledge emarginate above | 2. |
| — Frontal ledge not emarginate above | 3. |
| 2. Emargination shallow; body black. | <i>emarginata</i> , new species. |
| — Emargination deeper; body brown, blackish in parts | <i>crassicornis</i> , new species. |
| 3. Species larger, 1.76 mm; proportion 33.7 | <i>perplexa</i> , new species. |
| — Smaller, 1.20 mm; proportion 28.0 | <i>marylandica</i> Fouts. |

The four species listed above fall into two apparently natural divisions. *C. perplexa* and *marylandica* agree in having the upper margin of the frontal ledge entire, in having the pronotum angulate anteriorly on the sides, in having only a trace of a longitudinal ridge on the scutellum, and in having the propodeal processes devoid of pubescence above and on the sides. The two species *crassicornis* and *emarginata* differ in every one of these particulars.

The proportions (see introduction) are: for *emarginata* 28.0, for *crassicornis* 30.7, for *perplexa* 33.7 and for *marylandica* 28.0.

***Cracnopría emarginata*, new species.**

Male.—Length 1.41 mm. Scape about as long as the following three joints united; pedicel a very little longer than wide, subequal to joint seven; third joint about twice as long as wide, a little shorter and narrower than the fourth, longer but slightly narrower than the second; joints five to thirteen subequal, nodose, covered with rather long whitish hairs; joint fourteen a little longer than thirteen, conical.

Length of head 26, width 30, height 30; length of thorax 46, width 31, height 31; length of abdomen 55, width 35; length of second tergite 43.

Scape, pedicel, and legs, yellowish-brown; flagellum fuscous; body black.

Occurs at Hagerstown, Maryland. (Robert Fouts, September 17, 1915, one specimen, swept from wheat stubbles.)

Cracinopria crassicornis, new species.

Female.—Length 1.51 mm. Antenna clavate, the club three-jointed; scape as long as the joints nine to twelve united; pedicel globular, as long and as wide as the third joint, which is more or less triangular, a little longer than the fourth; joints four to nine about twice as wide as long, ninth a little longer; joints ten and eleven quadrate, distinctly wider than nine, very little shorter than twelve, the latter blunt at apex; all the flagellar joints (including the pedicels) thickly covered with rather long erect whitish hairs, those on the club joints shorter and more thickly distributed.

Length of head 24, width 30, height 30; length of thorax 42, width 26, height 28; length of abdomen 70, width 35; length of second tergite 43.

Legs bright straw-colored; antennae uniformly rather light reddish-brown; body dark reddish-brown.

Occurs at Hagerstown, Maryland. (W. R. McConnell, May 8, 1915, one specimen, swept from volunteer wheat.)

Cracinopria perplexa, new species.

Female.—Length 1.76 mm. Antennae lost; length of head 29, width 37, height 35; length of thorax 55, width 34, height 36; length of abdomen 75, width 43; length of second tergite 50.

Legs yellow, tinged with brown; thorax reddish-brown; abdomen the same color but darker, almost black on the second tergite.

Occurs at Hagerstown, Maryland. (P. R. Myers, September 21, 1914, one specimen, swept from wheat stubbles.)

Cracinopria marylandica (Fouts).

Trichopria marylandica, R. M. Fouts, Proc. Ent. Soc. of Washington, vol. 22, 1920, p. 62.

Following measurements made from paratype retained by the author; length of head 23, width 28, height 28; length of thorax 35, width 23, height 23; length of abdomen 50, width 32; length of second tergite 35.

Occurs at Hagerstown, Maryland. (H. L. Parker, July 31, 1915, four specimens, reared from a dipterous puparium.)

Ismarus americanus, new species.

Female.—Length 2.0 mm. Runs in Kieffer's key (Das Tierreich, Lief. 44, 1916, p. 354) to *halidayi* from which it differs in having the fourth antennal joint longer than the third and in not having a sharp ridge traversing the scutellar fovea.

Length of head 30, width 55; length of third antennal joint to length of fourth, as two is to three; third very little shorter than the first; antenna gradually thickening distally, the joints becoming shorter to the seventh; joints seven to fourteen subequal in length, the fourteenth a little the longest; length of thorax 75, width 45, height 55, densely pubescent where the surface is roughened, e. g., the upper and lower parts of the pronotum and propodeum; these parts rugose, especially the dorsum of the pronotum; mesosternum punctate,

more densely pubescent than the rest of the thorax; propodeum rugose, reticulate, areolate, with a high and sharp transverse ridge; hair on propodeum as long as that on the first segment of the abdomen but more dense; metapleurum rugose, densely pubescent; length of abdomen 85 (recurved apically), width 50, height 40, highly convex above, less so below, sparsely pubescent, shining and without sculpture (with the exception of the first segment which is furnished with irregular longitudinal carinae or ridges); length of first segment 14, width 19; length of second tergite 55; base of segment strongly fluted, the length of the deep median groove 33; the sutures separating the segments two to five from one another extremely fine and hard to trace; the suture between tergites five and six and that between six and seven are deeper, the latter being virtually a constriction; seventh tergite triangular, as long as wide, pointed apically.

Black; antenna brownish, lighter basally, the proximal three joints stramineous below; legs bright golden-yellow, with the following exceptions: most of tibia and femur of hind leg and last joint of tarsus of hind leg, brown; last tergite, and fifth and sixth narrowly laterally, and sternites three to six, brown or yellowish-brown.

Occurs at Carlisle, Pennsylvania. (Robert Fouts, July 23, 1920, one specimen.)

***Acropiestia semirufa*, new species.**

Female.—Length 3.0 mm. Differs from *subaptera* in having fully developed wings. Scape yellowish-brown, as long as the following four joints united; third joint longer than the pedicel, as long as the fourth and fifth united, not quite twice as long as wide; joints four and five subequal, quadrate; six and seven as long as five but a little wider; following joints transverse; fifteen slightly longer than three, less than twice as long as wide, rounded apically; flagellum brownish, darker than the scape; marginal vein punctiform, half as long as the first radial abscissa, the latter oblique, one-third the length of the second abscissa; cubitus slightly curved proximad; petiole rugulose, cylindrical, distinctly less than twice as long as wide; legs yellow; femora and tibiae stout, clavate; abdomen slightly depressed, elliptical, one-half longer than the thorax, pointed at tip; segments three to seven subequal; seven as long as the three preceding united; head, thorax and basal two-thirds of abdomen, reddish-brown; abdomen apically yellowish.

Occurs at Glen Echo, Maryland. (Robert Fouts, one specimen.)

***Anectata canadensis*, new species.**

Female.—Length 2.94 mm. Differs from *hirtifrons* Ashmead in having the scape a little less than twice as long as the third antennal joint.

The lengths of the antennal joints are as follows: 38, 10, 20, 15, 14, 14, 13, 13, 12, 10, 10, 9, 9, 14; all of the joints are subequal in width (about 8); length of thorax 100, width 68, height 75; length of abdomen 120, width 65, height 45; length of first segment 30, width 20, height 17; length of second tergite 90; abdomen moderately thickly covered with long white hairs; first tergite with five straight longitudinal ridges above, the distance between each of them being

about 5; second tergite with a deep longitudinal groove basally (length 25) and with a number of shorter grooves on each side of the central and larger one; that part of the abdomen posterior to the first segment is a perfect broad ellipse when viewed from above; the seventh segment is as long as the four preceding united, as wide as long, triangular, acute at apex; length of basal vein 28, of marginal vein 20, of the first abscissa of the radius 10, and of the second abscissa 45; radial cell closed; wings slightly tinged with brown; antennae rufous, becoming darker towards the apex, the terminal joints black; legs entirely rufous; body black.

Occurs at Gull Lake, Ontario. (H. S. Parish, June 13, 1921, one specimen.)

A NEW SPHINGID FROM NEVADA (LEPID.).

By WM. BARNES AND F. H. BENJAMIN, *Decatur, Illinois.*

Hyloicus gerhardi, new species.

Frons, and vertex whitish grey. Thorax similar, marked by black. Tegula with a heavy black edge. Abdomen grey, dusted with black, with usual black dorsal line, and white and black lateral patches. Fore wing: ground color whitish grey, suffused and dusted with black; a strong black shade below cell; black dashes in the interspaces between veins 2-3, 3-4, 5-6; a bent black apical dash from near vein 6; a wide strong inwardly oblique subterminal black line between veins 6-2, distally marked by whitish shades and indeterminate lines; fringes grey, marked with some white, but not checkered. Hind wing with median whitish band and basal whitish area, else black except for a gray outer margin; fringes pale grey, composed of black and white scales, but not regularly checkered. Beneath: fore wing grey, with only the apical mark distinct, fringes white, grey tipped, appearing faintly checkered due to a few black scales at the extremities of the veins; hind wing and its fringes, as on upper side.

Expanse.—♂ 74-80 mm.; ♀ 75-88 mm.

Allied to *vashti* Stkr., with a similarly pale thorax. Differs by its more general powdery appearance, lack of brown tones, usually stronger black line between veins 6-2, and by the thoracic vestiture which is composed of somewhat wider hair-like scales and presents a rougher appearance.

Types.—In Barnes collection; Paratypes in U. S. and Canadian National Museums, Field Museum, Tring Museum, and Clark collection.

Type localities and number and sexes of types.—Holotype ♂; Allotype ♀, 4 ♂, 13 ♀ Paratypes, Clark Co., Nev., 24-30 June; 3 ♂, 13 ♀ Paratypes, Las Vegas, Nev. (R. A. Eignor); 1 ♀ Paratype Charleston Mts., Southern Nevada (O. C. Poling).

We take pleasure in naming this species in honor of our friend Mr. William Gerhard, who brought us the type of *vashti* for comparison.

NEW PTILIDAE RELATED TO THE SMALLEST KNOWN BEETLE.

By H. S. BARBER, U. S. Bureau of Entomology.

Seventy years ago a Russian traveling in the United States collected a colony of microscopic beetles in a fungus in Georgia and no coleopterist appears to have found the species since. It was described as one-tenth line (a hundred-twentieth part of an inch) in length, and about one-fourth as wide. But although the writer has never seen a specimen of this species it can probably be found by any one who has the patience and vision to search for it in the Southern States, now that habits of certain related species described below offer the clue.

The present paper results from the receipt at the National Museum of a small vial containing fifty minute beetles and four larvae, supposed to be their young, from Dr. A. Dampf in the Federal District of Mexico, who believed them to be the smallest of all kinds of beetles. In this he is very nearly right, for although two or three slightly smaller species are below described, its length of just over a half millimeter is accompanied by the most slender and cylindrical body-form yet known in the family, measuring only about one-tenth millimeter in greatest diameter. These specimens were found in a "Polyporus" fungus (determined by Dr. J. R. Weir as *Fomes pinicola* (Swendener) Ckl.) growing on *Abies religiosa* in the Desierto de los Leones, Distrito Federal, Mex., at an altitude of nearly eleven thousand feet, and although no information was sent describing how it lived in the fungus, its extreme form strongly suggests specialization for life in the vertical spore tubes, and its coloration (clear yellow with the head black), suggests that it sits in the tubes, head downward, and nearly flush with the under surface of the fungus. The larvae, on the contrary have the tail-end infuscate and strongly armed, suggesting that it assumes the reverse position in the spore tube. Among the beetles in the vial was a unique example of a distinct but related genus (figured on plate 8, fig. 4-6 as *Mycophagus? robustus*) which raises doubts whether the four larvae belong to this species, or to the much narrower and more abundant beetle illustrated on plate 7 as *Cylindrosella dampfi*.

A sample of fungus later submitted by Dr. Dampf for identification displayed a number of dead beetles and larvae adhering to the under surface or in the spore tubes where they had apparently crawled to die as the fungus dried. There were also specimens of a remarkable predaceous Gamasid mite of such diameter and extreme elongation as to suggest adaptation to the form of the spore tubes. It should be remembered that these fungi are perennial and that the residence of a colony of beetles within a single fruiting body might well persist for a number of years.

So little is known about the "smallest beetle" that we can not accept the statements of the various writers who have discussed it as all referring to the same species. Eight papers¹ by five authors consider this species, recording four widely separated localities (Mobile, Ala., Georgia, Guatemala and Cincinnati, Ohio), which seem to the writer to indicate three distinct species confused under this name. Colonel Victor Motschoulsky collected specimens in a fungus either at Mobile, Ala., or in Georgia, but his letter of July 15, 1854 (See *Etudes Entom.* 1856, pp. 6-12), does not mention microscopic beetles although he describes collecting at Mobile and Atlanta and mentions beetles in fungi at the latter place. The same letter describes his visit in Philadelphia with LeConte who nine years later (1863) described this most minute beetle under the name *Ptilium fungi* as from Mobile, collected and given him by Motschoulsky. Five years later, 1868, Motschoulsky described what we must assume to be the same species as a new genus and species, *Nanosella fungi*, without citing LeConte's description, and recording its source as Georgia, so it would appear that Mobile was an erroneous record in the LeConte paper. It seems that Motschoulsky's types have never been re-examined, but a broken specimen from the LeConte collection was studied by Matthews who described and figured it in 1872 and 1884. The descriptions and figures by this same student (Matthews) in 1888 and 1900 are based on a specimen from Alta Vera Paz in Guatemala. The latter figures differ greatly in the shape of the scutellum and most probably represent an unnamed species, which being so well described should receive a new name (*matthewsi*, new species). For comparison the writer reproduces herewith copies of Motschoulsky's 1868 figures of *Nanosella fungi*, Matthews's 1872 figure of *Ptilium fungi* LeConte 1863 and Matthews's 1900 figure of the Guatemalan specimen (*matthewsi*).

No other collector in the United States seems to have observed these beetles except Charles Dury at Cincinnati, Ohio, who has encountered two colonies each representing a new form. In July, 1907, he noticed a great number of these microscopic beetles running on the under surface of a fungus (*Polyporus cuticularis*) growing on the under side of a small beech log, and by carefully cutting off the fungus and jarring it over his collecting bottle he secured more than fifty specimens which he identified from Matthews's 1884 paper as *Nanosella fungi*, and from which he distributed samples to numerous coleopterists. This determination remained unquestioned until the present time but a new generic and specific name (*Throscoptilium duryi*, see plate 8, figs. 12-14) is now proposed because his speci-

¹References are given in the list of works cited.

mens differ so greatly in outline, form of head, pronotum, scutellum, etc., from Matthews's 1872 figure. Seven years later, July, 1914, another colony of about 25 beetles behaving like those previously caught was found upon a different fungus, *Poria cinerea*, on an elm log, but of these Mr. Dury was only able to secure eleven specimens which he described as *Nanosella atrocephala* in 1916. One of his cotypes is here figured on plate 8, figs. 7-9, and the writer has recently obtained a broken specimen, apparently this species, from a specimen of the same species of fungus that had been collected in Louisiana in 1889 by A. B. Langlois. Another species differing from all others in being much darker in color was found in a "Polyphorus" in Panama by Mr. James Zetek in July, 1923, and is below described as *Mycophagus? panamensis* (see plate 8, figs. 10-11).

Having assembled this material and information and recognized that they represent a probably extensive group of species adapted to live in spore tubes of fresh, growing Polypore fungi, the writer was pleased to find the short but remarkable record by Dr. Friedenreich, 1883, which had been overlooked by Matthews but added by the editors of his posthumous Supplement (1900, p. 7). Friedenreich tells of examining a freshly grown cinnabar red Hymenomycete at Blumenau, in the state of Santa Catherina, Brazil, and observing a "dust small" insect issue from one spore-tube, investigate the surrounding surface and disappear into another spore-tube. Unable to recognize its order he hastened home and with the aid of a small brush preserved the entire little colony of beetles which he described as a new genus and species, *Mycophagus biclavatus*, and this generic name is here applied to several of the species.

The question of wide geographical distribution of a minute species of insect has often caused comment and is a phenomenon too easily dismissed for lack of data or by assuming commercial transportation, or misidentification of material from extreme localities. But all that might be needed to acquire great geographical distribution would be utilization of wind transportation as spores are scattered. The remarkable ciliate wings of these beetles suggest the passive function of the ciliae of downy seeds and although great difficulties are in the way of observing more than the start of their flight the writer believes them incapable of more than short flights by their own power. Supposing, however, that in a given species a sufficient percentage of the fertilized females instinctively rose in the air a few feet above the vegetation, then rested for a time with their ciliate wings expanded in the position in which many Ptiliids die, and on again alighting could find proper environment for their young—we might expect such a species in time to be carried by

air currents¹ throughout its possible habitat. But in the *Nanosellini* such survivors would be few, for instead of feeding on fungus spores in general as suggested by Flach's 1889 remarks on the contents of the intestine, the forms here treated appear specialized for devouring the soft, growing spores in particular species of fungi.

NANOSELLINAE, new subfamily

The species here considered appear thus to form a group closely related to each other in such structures as pertain to their dependence upon supposedly unripened spores of Polypore fungi, and abundantly distinct from other generalized Ptiliids by a number of characters such as: the more elongate form; shorter, stouter antennae, which rarely extend behind the middle of the pronotum; obliquely truncate elytra more or less rounded at apices due to convexity but exposing a declivous area on pygidium and propygidium which is surrounded by a ring of stiff hairs; and the curved anal spine of varying shape protruding from beneath the apex of the pygidium in both sexes. In view of these characters and their incompatibility in the recognized groups of Ptiliidae it appears necessary to consider the species as constituting a new subfamily, the NANOSELLINAE. The larva figured on plate 7, figs. 10-12, differs from the few other known Ptiliid larvae most prominently in its strong armature of the ninth tergite.

The forms now known to belong to this subfamily are included in the following very imperfect key; those whose characters are stated only on the authority of other students being indicated by an asterisk.

1. Size minute, one-fourth millimeter or less, form parallel 2.
 Size larger, 0.4 to 0.7 mm., form oval (except in *Cylindrosella*) 3.
2. Head and scutellum elongate. Georgia (?Atlanta) (vide Matthews 1872)
 Nanosella fungi (LeConte)*
 Head transverse, scutellum equilateral, Guatemala, (*N. fungi* Matthews
 1900 not Lec.) *Nanosella matthewsi* n. sp.*
3. Form cylindrical, very elongate, five times as long as wide, pronotum
 longer than wide, with sides parallel, scutellum elongate; length 0.6 to
 0.7 mm. Federal District, Mexico *Cylindrosella dampfi* n. sp.
 Form more oval and longitudinally more convex; pronotum transverse,
 narrowed anteriorly 4.
4. Mesosternal carina forming a spearhead-shaped area with the acute apex
 between mesocoxae and with short, feeble median carina in front;
 body form elongate oval. (*Mycophagus?*) 5.

¹Great numbers of a minute beetle, *Orthoperus glaber?* were encountered on the railing at the top of the Capitol dome, 280 feet, Washington, D. C., Oct. 10, 1911, under conditions that suggested their migration in the strong warm wind that was blowing from the southeast. An area of the railing was brushed clean and during our short stay several more specimens were found within the area but in such a wind it was impossible to see such minute things flying.

- Mesosternum very prominent, strongly compressed anteriorly into an abrupt carina with deep lateral cavities for reception of front coxae and legs, the median part inflated into an oval lobe which is produced backward in a thin, horizontal, parallel-sided plate overlying inner third of mesocoxae and meeting an elevated, anteriorly truncate process from the metasternum, similarly covering part of the mesocoxae (*Throscopitium* n. gen.)..... 8.
5. Color golden yellow, elytra rough with deep punctures, length 0.6 mm., width, 0.2 mm., Brazil..... *Mycophagus biclavatus* Fried.*
- Occiput all or partly piceus..... 6.
6. Occiput somewhat infuscate, the head darker near eyes, form narrower and more constricted at humeri, pronotum widest before base, length 0.42 mm., width 0.15 mm., Cincinnati, Ohio, in *Poria cinerea* (*Nanosella atrocephala* Dury)..... *Mycophagus atrocephalus* (Dury).
- Occiput entirely black, form more robust, pronotum widest at base..... 7.
7. Color pale except head, form more elongate, larger; length, 0.60 mm.; width, 0.18 mm. Federal District, Mexico (Dampf)..... *Mycophagus robustus*, n. sp.
- Castaneous, except elytral margin and apex, pronotum and parts of venter paler, head black, form more depressed; length 0.45 mm., width 0.17 mm. Canal Zone, Panama..... *Mycophagus panamensis*, n. sp.
8. Form short and stout, very robust anteriorly; pronotum almost semicircular; length, 0.42 mm.; width, 0.17 mm. Cincinnati, Ohio, in *Polyporus cuticularis* (*Nanosella fungi* Blatchley, Dury)..... *Throscopitium duryi*, n. sp.

Nanosella fungi (LeConte) Mots.

As above stated this species is unknown to the writer and for the present we must assume that *Ptilium fungi* Le Conte 1863 and *Nanosella fungi* Motschoulsky 1868 are identical and probably from the same capture at Atlanta, Georgia; also that the differences in outline between the figure by Motschoulsky and Matthews's 1872 illustration of a LeConte specimen are artist's errors in interpretation of form. LeConte states the length as "—scarcely more than 1-100 of an inch," Motschoulsky as "—hardly one-tenth ligne—" and Flach, 1889, as "—of only 0.2 mm. length—" all remarking upon the species as the smallest known beetle. Thus the copy of Motschoulsky's figures here reproduced (pl. 8, fig. 2) is slightly too small and the outline (redrawn entire from the half outline by Matthews, 1872), of the LeConte specimen shown beside it (pl. 8, fig. 1) is slightly too large for the 100 diameter enlargement intended.

The two original descriptions are here translated:

LeConte 1863, "—most minute, linear, testaceous, punctulate pubescent, thorax slightly shorter than wide, sides broadly rounded, elytra elongate, apices rounded, antennae and feet yellow. Mobile; Col. Motschulsky."

Motschulsky 1868, "Form elongate, narrow, almost parallel; elytra more than three times as long as pronotum and a little dilated behind, pronotum

without impressions, almost square and a little narrowed towards the head which is moderately small, posterior angles slightly obtuse; antennae short not passing base of pronotum, eyes distinct, punctuation very fine, pubescence invisible. Form recalling the narrow *Atomarias*. Color yellowish white, eyes black. Georgia in America. Inside a fungus."

***Nanosella matthewsi*, new name.**

Nanosella fungi Matthews 1888 and 1900—Not LeConte.

Believing the habitat of LeConte's species not likely to extend from Atlanta, Ga., to Vera Paz, Guat., and desiring to avoid the misleading inference that Matthews's 1900 figure of the latter specimen represents the structure of the genotype, a new name is here proposed based upon the latter figure and supported by the differences from the 1872 figure of *fungi* by the same author. The type is of course the single specimen found by Mr. Champion at San Juan in Vera Paz, Guat., and now assumed to be in the Godman & Salvin Collection in the British Museum. The differences have been mentioned in the table of species. An error in interpretation of the mesosternal epimeron in Matthews's description and figure is suspected. His anterior suture arising from the external anterior part of the coxal cavity coincides with what appears to be a muscle attachment inside the body and is not a suture in the forms here studied.

CYLINDROSELLA, new genus.

The elongate cylindrical form of the genotype (*C. dampfi*, new species) so lengthens all parts of the body that the recitation of contributive details such as elongate pronotum, scutellum, pro-, meso-, metasternum, etc., shown in the figures (plate 7), is unnecessary, but the inclusion of this linear species among the ovate species here doubtfully assigned in *Mycophagus* appears equally unwise. In addition to the characters in the table the following may be useful.

***Cylindrosella dampfi*, new species.**

Head large, subglobular, shining, black, impunctate; eyes lateral, very coarsely faceted; front strongly convex; labrum prominent, laterally compressed into a vertical prominence above the tips of the maxillae; antennae 11-jointed with laterally compressed three-jointed club. First joint large, subglobular; 2d as long as first but slightly narrower, cylindrical, slightly curved; 3d less than half as wide, cylindrical, as long as 2d; 4th and 5th short, together nearly equaling 3d; 6th, 7th and 8th larger, increasing in width, the 6th subglobular, the 8th twice as wide as long; 9th hemispherical, twice as wide as 8th; 10th shorter than wide; 11th conical, short. Maxillary palpi (pl. 7, fig. 4) with first joint small, second strongly pear-shaped and constricted near base, twice as long as first, third a little longer than second, and a third wider, subglobular or subquadrate,

fourth as long as third, very narrow, cylindrical, slightly curved. Rest of body yellow, sparsely clothed with decumbent hairs arranged in series on pronotum and elytra; the abdominal sternites except the first and last without hairs other than a single row on posterior margin of each, reaching nearly across the following segment. Pygidial spine a thin, narrow, apically emarginate process.

Type, allotype and paratypes.—Cat. No. 22993 U. S. N. M.

In the figures (pl. 7, figs. 1-3) the abdomen is more distended than in any of the dried specimens in which the propygidium is usually withdrawn under the elytra.

Described from 7 slides (9 ♂, 6 ♀) and 33 dry specimens (sexes not determined) from *Fomes pinicola* on *Abies religiosa* at 3200 meters altitude, Desierto de los leones, D. F. Mex., found by Dr. A. Dampf in whose honor the species is named. Two paratypes are in the Dury Collection.

***Mycophagus biclavatus* Fried. (1883).**

This species is unknown to the writer but it seems probably congeneric with *Nanosella atrocephala* Dury and the two species here described as new. *Mycophaga* Rond. 1856 (Anthomyidae) does not appear to invalidate the present generic usage. Friedenreich does not mention the pronotum nor mesosternum, and the mouthparts which he so carefully describes are not sufficiently displayed in the species before me. His description of the antennae needs correcting in that what he calls third and fourth joints may be considered the articulating basal part and the exposed principal parts of the third joint. This requires renumbering the following joints, making his apical appendage of his eleventh joint the reduced eleventh joint. The recorded habits have already been mentioned and the description need not here be quoted.

***Mycophagus? atrocephalus* Dury (1916).**

Two of Dury's cotypes have been examined, one of which unfortunately vanished while being studied. The remaining specimen has been remounted in balsam for safer preservation, and is sketched on plate 8, figs. 7, 8, 9. A third cotype kindly sent by Mr. Dury to replace the loss, shows the occiput almost black. The statement in the original description regarding widely separated hind coxae may be misleading as they are only slightly separated as in the other species. The middle coxae are apparently separated by the produced tip of the mesosternal spathula which overlies their internal margins, suggesting approach to the structure of this part in *Throscopitium*. The metasternal carinae are strongly convergent posteriorly and longer than in the other species. The specimen is a ♀ vaguely showing a large oval mass (shaped as in fig. 9, plate 8)

within the last sternite but so feebly chitinized that it is uncertain if it is the receptaculum seminis or a mature ovum. The length given as half a millimeter is also slightly too large, the cotype measuring 0.42 mm. in length and 0.15 mm. in width.

Type locality Cincinnati, Ohio. Host fungus *Poria cinerea*.

Two cotypes in the National Collection, no. 26801 U. S. N. M.

Examination of the dust brushed from an herbarium specimen of this species of fungus collected in Louisiana thirty-five years ago (Jan. 21, 1889) yielded a specimen believed to be this species although the head and prothorax are missing. It is a male with the aedeagus close to one side and much as in *Cylindrosella* (Plate 8, fig. 6) and no noteworthy differences from the cotypes are observed.

***Mycophagus? robustus*, new species.**

(Pl. 8, figs. 4-6.)

Elongate oval, moderately depressed, pale testaceous except the infusate head; body widest at middle, less than one-third as wide as long; eyes rather large, sublateral; front polished, piceus, strongly convex. Pronotum transverse, sides nearly straight, strongly convergent, base and apex broadly arcuate; a faint transverse marginal groove before base. Scutellum nearly equilateral, slightly elongate. Elytra twice as long as wide, translucent yellow showing the two masses of alar hairs as short median vittae. Mesosternum with short median carina anteriorly, the spear-head shaped median area twice as long as wide with the acuminate apex passing as a microscopic septum between mesocoxae and meeting a short similarly fine carina on the metasternum. Metasternum two-thirds as long as wide; postmesocoxal carinae short, arcuate, posteriorly convergent.

Length, 0.60 mm., width, 0.18 mm.

Type.—Cat. No. 26994 U. S. N. M.

Described from a single male specimen received in the same vial with nearly fifty specimens of *Cylindrosella* collected from a "Polyporus" on *Abies religiosa* at 3200 meters altitude, Desierto de los Leones. D. F., Mexico, collected by Dr. A. Dampf.

This is the largest species of the group before me and is nearly the size, form and color of the genotype (*biclavatus*) whose only known locality is approximately five thousand miles distant. It is similar in form, sculpture, and vestiture to *M. atrocephalus* but the form of the mesosternum has not been so adapted to receive the front coxae when the pronotum is deflexed.

***Mycophagus? panamensis*, new species.**

(Pl. 8, figs. 10, 11.)

Elongate oval, depressed, castaneous, the tip of the abdomen, under side of head and prothorax and the appendages testaceous. Pronotum nearly as long as wide, sides feebly arcuate, strongly convergent. Scutellum large, wider than long, apex produced. Elytra but slightly wider than base of pronotum, widest

before middle, sides feebly arcuate, apices sub-conjointly rounded; disc with sparse coarse black spots (punctures?) irregularly arranged in series. Mesosternal spathula two-thirds as wide as long, apical angle about 70°. Receptaculum seminis small, spiral, as indicated in fig. 11.

Length, 0.45 mm., width, 0.17 mm.

Three specimens (two females in balsam, one imperfect specimen dry) collected in a "*Polyporus*" on the Rio Indio in the Canal Zone, Panama, Aug. 27, 1923, by Mr. James Zetek. (No. 2256.)

Type and paratypes.—Cat. No. 26995 U. S. N. M.

***Throscopitium duryi*, new species.**

(Pl. 8, figs. 12-14.)

Fulvous except black head, thickly clothed with long, decumbent pubescence which is arranged in irregular transverse series. Body stout, widest at base of pronotum which is semicircular. Elytral margins feebly arcuate and convergent, posteriorly broadly rounded. Head nearly vertical, black. Antennae passing middle of pronotum, the club narrow with penultimate joint cylindrical, and longer than wide. Metasternum half as long as wide, the postmesocoxal carinae strongly convergent and nearly reaching the middle of posterior margin. Abdomen short conical, greatly retracted in most specimens, the receptaculum seminis a globular, feebly chitinated mass within the last segment (fig. 14), much as in *atrocephalus*; the aedeagus short, stout, arcuate and slightly constricted before apex.

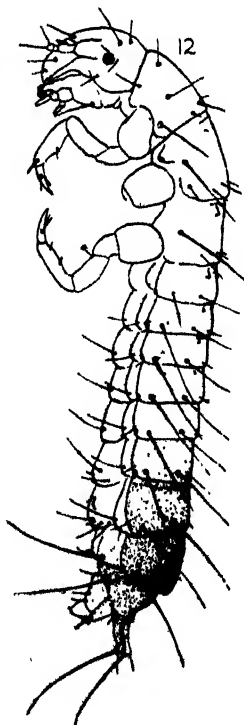
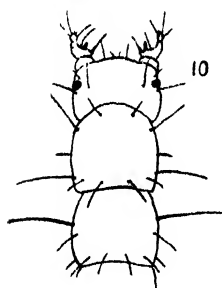
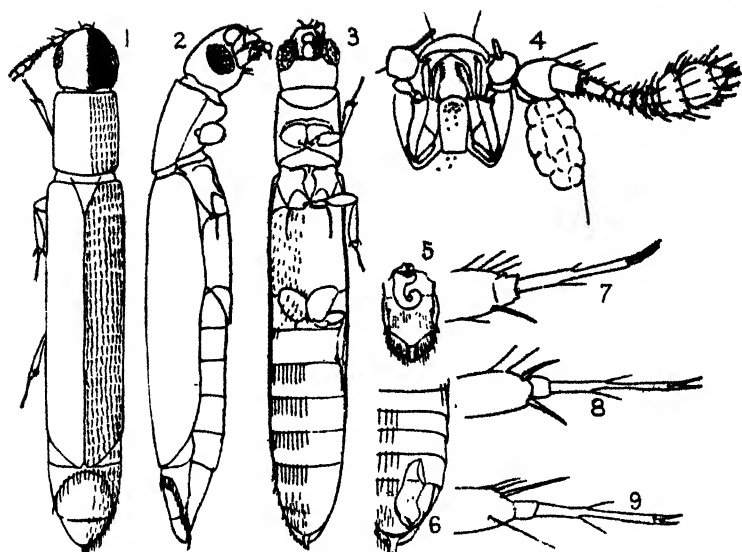
Length, 0.42 mm. (0.48 mm. distended from KOH), width, 0.18 mm.

Type, allotype and five paratypes.—Cat. No. 26996 U. S. N. M., all but two paratypes preserved in balsam. Four paratypes on card points returned to Mr. Charles Dury.

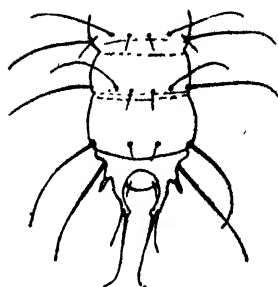
Described from eleven specimens from a large series taken by Mr. Charles Dury near Cincinnati, Ohio, from a fungus, *Polyporus cuticularis*, growing on the under side of a small beech log, July 18, 1907. Mr. Dury writes that they were clustered on one patch of fungus, running over its surface but not going off onto other surfaces. He cut the fungus off and took it home where on the 23d a few more specimens were jarred from it. On the same log was living a colony of *Microsternus* (*Megalodachne*) *ulkei* Cr. which Mr. Dury informs me lives only upon this species of fungus.

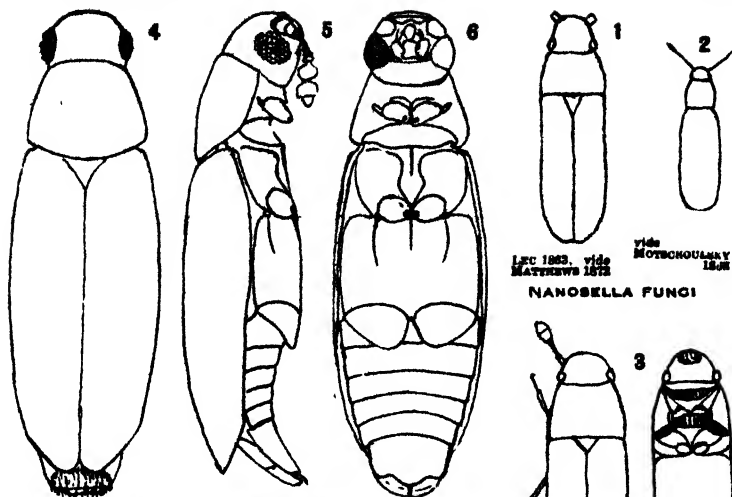
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- 1872 MATTHEWS.—Monograph Trichopterygia. pp. 19, 32 & 68, pl. 20, fig. 6. (*Nanosella fungi* Mots.) [LeConte]
- 1883 FRIEDENREICH.—Entom. Zeitung. Stettin. vol. 44, p. 379.—(*Myco-phagus biclavatus*)



Cylindrosella dampfi X 100
and probable larva



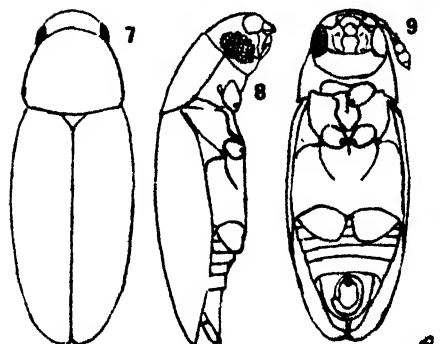


LEU 1923. vide
MATTHEWS 1922
vide
MOTSCHOUKOV
1924

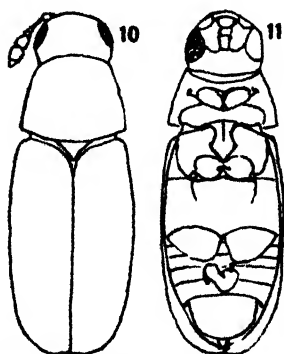
NANOSELLA FUNGI

MYCOPHAGUS? ROBUSTUS

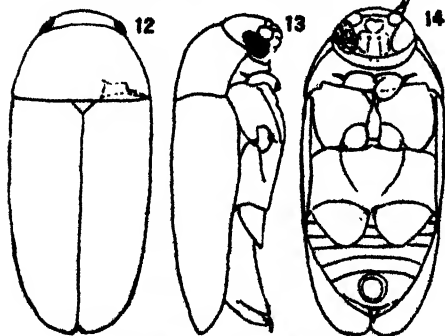
NANOSELLA MATTHEWSI



MYCOPHAGUS? ATROCEPHALUS



MYCOPHAGUS? PANAMENSIS



THROSCOPTILIUM BURYI

- 1884 MATTHEWS.—Trans. Amer. Ent. Soc. vol. 11, p. 153.—(*Nanosella fungi* Mots)
 1888 MATTHEWS.—Biol. Centr.-Amer., Coleoptera, vol. 2, pt. 1, p. 153.—
 (*Nanosella fungi* Matthews, not LeConte)
 1889 FLACH.—Verh. Zool.-Bot. Gesellsch. Wien., vol. 39, p. 486 & 488.—(food
 of family and mention of *Nanosella*)
 1900 MATTHEWS.—Supplement Monogr. Trichopt. p. 107, pl. 13A.—(*Nano-*
sella fungi Matt. not Lec.)
 1910 BLATCHLEY.—Coleopt. Indiana, p. 487.—(*Nanosella fungi* Blatchley not
 LeConte)
 1916 DURY.—Journ. Cincinnati Soc. Nat. Hist. vol. 22, p. 14.—(*Nanosella*
atrocephala)

EXPLANATION OF PLATES 7, 8.

Plate 7. *Cylindrosella dampfi*.

- Figs. 1, 2, 3, dorsal, lateral, ventral of distended adult. x 100
 4, antennae, maxillae and mentum more enlarged.
 5, receptaculum seminis within detached last abdominal segment. x 100
 6, aedeagus within ♂ abdomen. X 100
 7, 8, 9, front, middle and hind tarsi, much enlarged.
 10, probable larva, dorsal aspect of anterior and posterior ends of dis-
 tended specimen. X 100
 11, anterior aspect of head of same.
 12, lateral aspect of contracted and slightly flattened larva. X 100

Plate 8. other *Nanosellini*. X 100.

- Fig. 1, *Nanosella fungi*, redrawing from Matthews 1872 figure of LeConte's
 specimen.
 2, same species (?), redrawn from figure by Motschoulsky 1868.
 3, *Nanosella matthewsi*, dorsal and ventral, redrawn from Matthews's
 1900 figures.
 4, 5, 6, *Mycophagus? robustus*.
 7, 8, 9, *Mycophagus? atrocephalus*.
 10, 11, *Mycophagus? panamensis*.
 12, 13, 14, *Throscopitium duryi*.

CHANGE OF PREOCCUPIED NAME (DIP.).

BY R. C. SHANNON, U. S. Bureau of Entomology.

Dr. F. M. Root kindly notified me that the name *Chrysops vitripennis* Shannon is preoccupied by *Nemorius (Chrysops) vitripennis* Meigen. The name *hyalinus* is proposed in its stead.

A NEW MITE FROM THE LUNG SAC OF A RATTLESNAKE.By H. F. EWING, *U. S. Bureau of Entomology, Washington, D. C.*

Dr. W. A. Riley, of the University of Minnesota, has found in the lung sac of a rattlesnake an interesting Dermanyssid mite which he has kindly sent to the writer for determination. The specimen sent proves to be a species of *Entonyssus*, a genus established in 1922 for a mite taken from the lung sac of a Pine snake which had died at the National Zoological Park. A description of the new species follows:

***Entonyssus rileyi*, new species.**

Mouth-parts well developed. Chelicerae stouter than the palpi; fixed arm harpoon-like and extending beyond the movable arm by the width of ventral, distal process; movable arm stouter than fixed arm, almost straight, and with a rough cutting edge. Palpi extending to distal end of first femur; distal segment almost twice as long as broad, terminated by a slightly curved tactile seta and decidedly the smallest of the segments; penultimate segment longer than the antepenultimate, but not so stout.

Abdomen about as broad as long and broadly rounded behind; naked. Anus small and almost terminal. Anal plate very poorly chitinated.

Legs large, first and last pairs longer than the second and third pairs. Tarsus of leg I about one and a half times as long as tibia, of even width throughout and truncate at its tip; tibia I slightly longer and slightly narrower than patella I; patella I as stout as femur but much shorter. Tarsus II tapering, slender, twice as long as tibia II and with pseudo-joint near the base; tibia II subequal in length to patella II but not so stout. Tarsus IV very slender and tapering, the longest of all the tarsi and with a pseudointersegment near the base; tibia IV as long as patella IV but not so stout. All the legs with sharp tarsal claws and conspicuous caruncles.

Length 1.16 mm.; width 0.58 mm.

Type host and type locality.—Rattlesnake, from Texas.

Type.—Cat. No. 23775, U. S. N. M.

Description based on a single specimen, the holotype, which is a female. Speaking of this mite Dr. Riley states: "I have finally obtained one and on closer examination have confirmed my suspicion that the mites were from the lung sac rather than from the body cavity. This last snake had a single mite, but it was in the lungs; and in the examination of the first specimen I subsequently found a single mite within the lung." This species differs from *E. halli*, the only other species of the genus, particularly in the shape of the chelicerae, the movable finger being stout and almost straight instead of being slender and falciform.

**A NEW MOTH INJURIOUS TO COCOANUT PALM
(LEPIDOPTERA: LIMACODIDAE).**

By WM. SCHAUS.

***Natada urichia*, new species.**

Male.—Head, thorax and fore wing cinnamon drab; collar indistinctly mottled with some grayish hairs; abdomen slightly darker. Fore wing: costa suffused with light cinnamon drab; a whitish line from costa close to subterminal inbent to middle of inner margin, the subterminal vertical to vein 3, both lines proximally edged by a walnut brown line, the subterminal below vein 3 brownish, close to termen and almost obsolete; cilia drab crossed near base by a fuscous line. Hind wing cinnamon brown suffused with fuscous; cilia as on fore wing.

Female.—Wings faintly suffused with vinaceous, the lines further from apex. The male antennae are moderately pectinated as in *N. subpectinata* Dyar to which it is closely related, the latter species being smaller, darker, the frons and collar buff white, the vertex light ochraceous buff.

Expanse. —♂ 20 mm.; ♀ 24 mm.

Habitat.—Trinidad, B. W. I.

Type.—Cat. No. 27528 U. S. N. M.

Received from F. W. Urich.

AMBLYCORYPHA BRACHYPTERA BALL (ORTHOPTERA).

By A. N. CAUPELL, U. S. Bureau of Entomology.

In 1897¹ Dr. E. D. Ball published a record of an *Amblycorypha* under the specific name *brachyptera* Bruner. But that name was purely a manuscript one, as Bruner never described such a species. The only other mention in literature of this name is in Scudder's index to the Orthoptera published in 1901, where it is merely entered in an alphabetic list. The importance of this matter lies in the fact that in the article by Dr. Ball we find the statement that *brachyptera* has shorter wings than the two species immediately preceding it, these being *oblongifolia* DeGeer and *rotundifolia* Scudder. Thus he gave a structural character, which validates the species under rules of nomenclature at present in force. And, indeed, the character of possessing shorter wings than the other species mentioned in comparison is specific, and sufficient in itself to differentiate the species, though the identity is established with even more assurance by the examination of a topotype recently collected by Dr. Ball. It is the same species as that described by the present writer under the specific name *isleyi* in 1905.² Thus the specific name *isleyi* Cdl. falls into the synonymy under *brachyptera* Ball. As *isleyi* is a variety of *rotundifolia*, Ball's species will be known as *Amblycorypha rotundifolia brachyptera* Ball.

¹Proc. Iowa Acad. Sci., Vol. iv, p. 237.

²Journ. N. Y. Ent. Soc., Vol. xiii, p. 50.

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DISTRICT OF COLUMBIA DIPTERA: TROMOPTERA (CYRTIDAE,
BOMBYLIIDAE, THEREVIDAE, SCENOPINIDAE).

BY F. R. COLE, J. R. MALLOCH, AND W. L. McATEE

Family CYRTIDAE.

This small family contains some of the most interesting flies known to science, both their structures and their habits being very unusual in the suborder to which they belong. They are unique in the Brachycera in having some of the abdominal spiracles situated in the tergites and also in having larvae which live internally in spiders. The eastern species are for the most part rare in collections and it is very seldom that the insects are met with commonly in the field, though there are records of some cases in which they have been found flying in numbers around dead twigs of trees. All the eastern forms are rather small, with small heads, aborted mouth parts, and inflated balloon-like bodies. The western genus *Eulonchus*, and the species of *Lasia* found in Mexico and South America have the proboscis elongated and are known to feed on the nectar of flowers. These species are quick, strong fliers, but the eastern forms are not very active and have a floating, aimless sort of flight.

Key to the genera.

1. With three distinct ocelli. 2
 With but two distinct ocelli. 3
2. Costa of wing thickened near apex of first vein, usually with a spur at this point in the male; antennae inserted below middle of head in profile, third segment with three long apical hairs. *Pterodontia*.
 Costa of wing not thickened and without a spur at apex of first vein; antennae inserted on top of head, third segment with a slender apical arista. *Acrocera*.
3. Venation of wings complete, attaining margin, discal cell present; antennae situated on top of head, near vertex. *Opsebius*.
 Venation of wings incomplete, most of the veins not attaining margin of wing; discal cell absent; antennae inserted low down on head, near margin of mouth. *Ogcodes*.

Genus **PTERODONTIA** Gray.

P. analis Westwood.—Beltsville, Md., July 9, 1916, McAtee.

Genus **ACROCERA** Meigen.*Key to the species.*

1. Second longitudinal vein represented by a very distinct apical rudiment;
wings fumose *bimaculata*.
- Second longitudinal vein obliterated; wings hyaline..... *unguiculata*.

A. bimaculata Loew.—Virginia shore above Key Bridge, Aug. 3, 1914, McAtee; Plummers Id., Md., May 31, 1915, R. C. Shannon; May 8, 1915, Jacksons Id., Md., Aug. 31, 1902, H. S. Barber.

A. unguiculata Westwood.—Fort Washington, Md., May 26, 1885, C. W. Johnson.

Genus **OGCODES** Latreille.*Key to the species.*

1. Length 7-9 mm.; wings strongly infuscated..... *incultus*.
Smaller species; wings usually hyaline 2.
2. Male orange to brownish yellow, with dark brown spots on the abdominal spiracles; female brown, with indistinct lighter margins on the abdominal segments *dispar*.
Species with a different coloration 3.
3. Humeri yellowish; scutellum more or less yellow; posterior margins of abdominal segments with broad, sharply defined white margins .. *costatus*.
Humeri blackish; scutellum blackish 4.
4. Legs dull yellowish, coxae black *borealis*.
Legs black or blackish brown; wings hyaline; rims of halteres blackish *pallidipennis*

O. borealis Cole.—Plummers Id., Md., Aug. 23, 1919, H. S. Barber.

O. costatus Loew.—Vienna, Va., June 4, 1913, R. A. Cushman; same locality and date, in copula, C. W. Hooker; Falls Church, Va., June 1, 1916, Wm. Middleton, Aug. 26, 1915, C. T. Greene, Aug. 27, N. Banks; Maywood, Va., June 4, 1922, McAtee; Glen Echo, Md., May 26, 1923, Malloch; Branchville to Beltsville, Md., June 4, 1914, L. O. Jackson.

O. dispar Macquart.—Plummers Id., Md., May 30, 1911, H. S. Barber, June 4, 1905, E. A. Schwarz; June 13, 1905, D. H. Clemons; Aug. 9, 1902, E. A. Schwarz and H. S. Barber; Aug. 9, 1914, McAtee; Aug. 28, 1912, in copula, E. A. Schwarz; Beltsville, Md., June 15, 1919, L. L. Buchanan.

O. incultus Osten Sacken.—Falls Church, Va., N. Banks.

O. pallidipennis Loew.—Falls Church, June 23, N. Banks; Maywood, Va., June 20, 1921, McAtee; Dixie Landing, Va., May 25; Washington, D. C., June 1, C. H. T. Townsend; June 11, P. R. Myers; College Park, Md., Aug. 17, 1912, W. D. Appel.

Genus **OPSENIUS** Costa.

O. sulphuripes Loew.—Falls Church, Va., August 11, N. Banks.

Family BOMBYLIIDAE.

This family, various species of which are popularly known as bee flies or flower flies, is not so numerously represented in this as in some other regions. Many of the species frequent sandy areas and as a whole the family is better represented in the western plains states than in the east. The larvae so far as known are predacious or parasitic, some such as *Exoprosopa fascipennis* attacking hymenopterous primary parasites of other insects, others are inquilines or parasites in the nests of bees and wasps, or in the burrows of coleoptera, or are parasitic on grasshopper eggs, or lepidopterous larvae. The adults frequent flowers and fly in bright sunshine. They poise in the air and when disturbed dart away with a rapidity which baffles the eye.

Key to the genera.

1. Distance between anterior cross-vein and furcation of second and third veins, not greater than length of anterior cross-vein; second vein bent at base, leaving third at, or almost at, a right angle, or the discal cell confluent with second basal cell 2
Distance between anterior cross-vein and furcation of second and third veins much greater than length of anterior cross-vein, second vein usually forming an acute angle with third at its base; discal cell always separated from second basal cell 5
2. Second vein very short, connecting with first at middle of wing to form a small subtriangular cell; no cross-vein between discal and second basal cells *Pachyneres*.
Second vein long, entering costa near apex of wing; a cross-vein between discal and second basal cells 3
3. Apex of antennal style with a pencil of stiff hairs; pulvilli distinct, normal; vertex more or less abruptly declivous immediately behind ocelli, posterior ocelli in line with hind angles of eyes; basal costal process broad, subtriangular or leaf-like. *Spogostylum*
Apex of antennal style without a pencil of stiff hairs; pulvilli vestigial or absent; vertex not abruptly declivous immediately behind ocelli; basal costal process of wing lanceolate or spike-like. 4
4. Pulvilli of mid and hind tarsi replaced by a tooth-like process which simulates a basal tooth to each claw. *Exoprosopa*.
Pulvilli absent, claws at most slightly angulate basally *Anthrax*
5. Wing with 4 posterior cells. 6.
Wing with 3 posterior cells. 12.
6. First posterior cell closed 7.
First posterior cell open 8.
7. First basal cell of wing not longer than second *Systorchnus*.
First basal cell of wing longer than second. *Bombylius*.
8. Proboscis short, hardly extending beyond anterior margin of mouth opening *Anisotamia*.
Proboscis long and slender, extending very much beyond anterior margin of mouth opening 9.

9. Anal cell closed; body sparsely hairy..... *Phthiria*.
 Anal cell open; body densely haired or scaly..... 10.
10. Vestiture of antennae, thorax, and abdomen consisting entirely of hairs,
 or body almost entirely bare; wings bare..... 11.
 Vestiture of antennae, thorax and abdomen consisting largely of flat
 scales; wings partly scaly..... *Lepidophora*.
11. Body robust, densely hairy..... *Sparnophilus*.
 Body slender, practically bare..... *Metacosmus*.
12. Abdomen remarkably elongate and slender, its length distinctly exceeding
 that of wing, segments of basal portion 4 or 5 times as long as broad when
 seen from above, the insect resembling a species of Spheg (Hymenoptera,
 Aculeata); eyes in both sexes touching above; body sparsely short
 haired..... *Systropus*.
 Abdomen not elongate, subcylindrical or conical, not noticeably longer
 than wings, the tergites basally not longer than broad when seen from
 above; eyes of females widely separated above..... 13.
13. Body and legs largely or partly clothed with scales..... *Toxophora*.
 Body and legs without scales..... 14.
14. Antennae long and slender, tapered to a point..... *Geron*.
 Antennae robust, not tapered to a point, with a short style before apex
 above..... *Rhabdoselaphus*.

Genus **SPOGOSTYLUM** Macquart.*Key to the species.*

1. Anal angle of wing undeveloped, the cell between anal vein and margin of
 wing narrower than the one in front of that vein, and narrower basally
 than apically; wing broadly blackened along fore margin from base to
 apex, the dark color covering entire base, its posterior outline notched
 or undulated beyond base; basal costal process, squamae, and most of the
 hairs in the fringes behind the latter, fuscous..... *argyropyga*.
 Anal angle of wing developed, the cell between anal vein and margin of
 wing broader than the one in front of that vein, widest at or near middle,
 or at base..... 2.
2. A cross-vein connecting the vein forming hind margin of discal cell beyond
 its middle with the vein behind it, forming a small closed cell; all veins
 of wings bordered with dark brown, which color is in places confluent,
 forming several large irregular blotches..... *simson*.
 No cross-vein connecting the above veins; rarely there is a spur of a vein
 projecting from hind side of discal cell, but it never connects with the
 vein behind it to form a closed cell; wings otherwise marked..... 3.
3. Squamae and basal costal process of wing entirely fuscous..... 4.
 Squamae apically whitish, basal costal process yellowish apically..... 4.
4. Wings entirely blackened; fringes of squamae fuscous..... *slossonae*.
 Wings blackened on basal half, the angulated outline of the dark area
 extending diagonally across wing from apex of anal cell to a point about
 one-third from apex of costal margin; fringes of squamae largely pale....
anale.

5. Entire field of wing peppered with black dots which form patches on parts of disc, especially on basal half and near costa; fringe behind squamae largely or entirely black.....*oedipus*.
Wing with a few dark spots, confined largely to the cross-veins and forks of the longitudinal veins, and more or less broadly, conspicuously suffused with fuscous basally.....6.
6. Black color of basal portion of wing not sharply limited apically, the tips of wings smoky, not pure hyaline; cross-vein at apex of discal cell usually distinctly infuscated; costal vein distinctly thickened at base; male hypopygium with the apical dorsal pair of processes broad, barely rounded at apices, the bristles fine and hair-like, the shoulders at bases of these processes on inner side forming a right angle, the outer margin of hypopygium with a broad rectangular shoulder about one third from apex.....*obsoletum*.
Black color of basal portion of wing less extensive, sharply limited apically, the tips of wings pure hyaline; cross-vein at apex of discal cell usually unclouded; costal vein not thickened at base; male hypopygium with the apical dorsal pair of processes narrowed apically, the tips narrowly rounded, and with short stiff bristles, the shoulders at bases of these processes not forming a right angle, more forwardly projecting, simulating a short-round process, the outer margin of hypopygium more rounded off on the swollen part at base of the apical process 7.
7. Fork of third vein with a conspicuous fuscous spot.*limotulus*.
Fork of third vein not spotted.*limatulus* var. *pauper*.

S. anale Say.—Great Falls, Va., Sept. 5, 1916, McAtee; Falls Church, Va., July 15, 1917, I. N. Gabrielson; Aug. 4, 1913, Sept. 13, 1912, C. T. Greene; Kalmia Road, D. C., Sept. 9, 1916, McAtee; Riverdale, Md., June 2, Beltsville, Md., July 16, Cole; Odenton, Md., July 29, 1917, McAtee.

S. argyropyga Wiedmann.—The most common species of the genus; found throughout the region; season June 9 to Sept. 1; has been taken on flowers of *Viburnum nudum*. P. I.

S. limatulus Say (*albofasciatum* Macquart; *pauper* Loew).—Cabin John, Md., June 24, Cole; Bladensburg, Md., June 4, 1916, on flowers of *Tephrosia virginica*, L. O. Jackson; Beltsville, June 16, 1918, July 1, 1917, July 4, 1912, McAtee; July 6, 16, Sept. 10, Cole; Odenton, Md., June 11, 1922, McAtee. *S. limatulus* var. *pauper* Loew (var. a. Say).—Beltsville, Md., June 9, N. Banks; July 4, 1912, 1916, McAtee; Aug. 22, 1917, C. T. Greene; Brookland, D. C., June 18, 1914, in copula, J. B. Parker; Bladensburg, Md., June 23, 1916; Camp Meade, Md., June, 1918, Shannon.

S. obsoletum Loew.—Falls Church, Va., June 16, 1915, on flowers of *Ceanothus*, C. T. Greene; Sept. 10, N. Banks; Mt. Vernon, Va., July 4, 1917; Plummers Id., Md., June 14, 1908, July 7, 1912; Beltsville, Md., July 9, 1916, McAtee.

S. oedipus Fabricius.—Common and widespread; extreme dates of collection, May 19 and Oct. 10. P. I.

S. simson Fabricius.—Common and widely distributed; season July 12 to August 28; in copula July 14; bred specimens have emerged July 27 and Aug. 8.

S. slossonae Johnson (*cephus* auctt. nec Fabricius).—Falls Church, Va., June 18, N. Banks; June 23, 1915, C. T. Greene; June 24, 1915, S. A. Rohwer; Glencarlyn, Va., July 8, 1915, C. T. Greene; Plummers Id., Md., Aug. 4, 1907, July 19, 1924, Shannon; Maryland near Plummers Id., July 27, 1916, McAtee; Hyattsville, Md., Aug. 3, 1916; Beltsville, Md., July 2, 1916, W. R. Walton; June 25, 1915, R. C. Shannon.

Genus **EXOPROSOPA** Macquart.

Key to the species.

- Wings blackish brown, a small spot near middle of disc, and the apices broadly hyaline, the hyaline part usually extending narrowly along posterior margin and sometimes more or less connected with the central hyaline spot..... *emarginata* Macquart.
- Wings blackish brown, with two broad irregular hyaline fasciae, one near base and the other beyond middle, neither of which reaches the costal margin, and the apical hyaline part usually connected with the outer hyaline fascia at the hind margin..... *fascipennis* Say.

E. emarginata Macquart.—Common; season June 12 to July 29; in copula July 13; has been collected on flowers of *Ceanothus americanus*, *Sericocarpus linifolius*, and *S. bifolius*. V. P. I.

E. fascipennis Say.—Fairly common; extreme dates of collection June 12 and September 28; has been collected on flowers of *Sericocarpus bifolius*.

Genus **ANTHRAX** Scopoli.

Key to the species.

1. Wings without conspicuous markings; upper mouth margin not produced conically 2.
- Wings with conspicuous brown or fuscous markings..... 3.
2. More slender, smaller species; fourth and fifth abdominal segments with some conspicuous scale-like hairs on sides; fore tibiae without posterodorsal setulae..... *lateralis*.
- More robust, larger species; abdominal segments without conspicuous scale-like hairs on sides; fore tibia with a series of distinct posterodorsal bristles..... *alternata*.
3. Basal half or more of wings almost or entirely solid brown or fuscous, apical part entirely hyaline..... 4.
- Wings mottled or streaked, not sharply bipartite in color..... 5.
4. Outer edge of dark portion of wing forming an almost straight line, not conspicuously crose nor produced along costa; hairs of abdomen largely fulvous; face conspicuously subconically produced above mouth.... *fulvohirta*.

Outer edge of dark portion of wing conspicuously erose and produced to near tip of costa; hairs and scales of abdomen largely black; face very little produced above mouth..... *sinuosa*.

5. Wing markings consisting of fused or subcontiguous fuscous spots which form three more or less well defined groups, one at base, a fascia just before middle, and another beyond middle, with one or two small spots at apex of costa; a cross-vein connecting fork of third vein near its base with the vein in front of it..... *banksi*.

Wing largely yellowish brown, darker along the veins and with one or more small subhyaline marks near middle and at apex; no cross-vein connecting fork of third vein with the vein in front of it..... *ceyx*.

A. alternata Say.—Falls Church, Va., July 1, S. A. Rohwer; Great Falls, Va., June 29, 1915, C. T. Greene; Plummers Id., Md., July 10, 1910, July 21, 1912, McAtee; Hyattsville, Md., Sept. 24, 1916; Riggs Mill, Md., Sept. 18, 1916; Beltsville, Md., July 23, 30, 1916, W. R. Walton; June 28, 1911, F. Knab.

A. banksi Johnson (*serpentina* Auctt. nec Osten Sacken [*Dipalia* O. S.]).—Great Falls, Va., Aug. 6, 1913, C. T. Greene; July 8, Sept. 12, N. Banks; Aug. 1, 1916; Scott's Run, Va., July 4, 1918; Falls Church, Va., Sept. 7, N. Banks; Beltsville, Md., July 4, 1916, McAtee; Linneville, Md., July 4, 1913, R. C. Shannon.

A. ceyx Loew (*halcyon* Auctt. nec Say; *nigripennis* Cole).—Dead Run, Va., June 10, 1922, McAtee, Falls Church, Va., June 24; Glencarlyn, Va., July 2; N. Banks; Beltsville, Md., July 2, 4, 1916, W. R. Walton; July 9, Sept. 7, 1916, Cole; July 6, 1916, C. T. Greene; July 4, 1915, Odenton, Md., July 4, 1913, McAtee.

A. fulvohirta Wiedemann.—Common in the Coastal Plain; season June 30 to Sept. 28; has been collected on flowers of *Sericocarpus bifolius*.

A. lateralis Say.—Abundant and widespread, extreme dates of collection June 10 and October 2; has been taken on flowers of *Ceanothus americanus* and *Daucus carota*. P. I.

A. sinuosa Wiedemann.—Common and widely distributed; season June 4 to Sept. 3; visits flowers of *Ceanothus americanus*. P. I.

Genus **BOMBYLIUS** Linnaeus.

Key to the species.

1. First posterior cell of wing open, or closed only at extreme apex..... *ater*.
First posterior cell of wing closed at a considerable distance from margin of wing..... 2.
2. Cross-vein distinctly beyond middle of discal cell; wings with isolated dark spots..... 3.
Cross-vein not beyond middle of discal cell..... 4.
3. Wing markings fasciate, the spots almost all connected; cross-vein at much less than its own length from apex of discal cell; apical curvature of second vein almost a right angle..... *pulchellus*.

Wing markings consisting of a fuscous suffusion on front half of wing from base to middle which tapers off beyond that point, and several isolated spots in the hyaline posterior half of wing; cross-vein at about its own length from apex of discal cell; apical curvature of second vein rounded....

pygmaeus.

4. Mid femur with a few bristles on anteroventral surface; wings grayish, slightly darker basally and along costa; pile of body mostly hoary....*incanus*.
Mid femur without anteroventral bristles, with fine hairs basally.... 5.
5. Wing almost uniformly infuscated, paler (lutescent) rather than darker basally*fraudulentus*.
Wings with contrasting hyaline and fumose areas, darker basally. 6.
6. Wing with the dark markings consisting of a dark brown costal blotch extending from base to apex of second vein, the posterior margin of which is irregularly sinuated and abruptly differentiated from the hyaline hind part of wing; pile of body mostly tawny *major*.
Wing with the dark markings consisting of a basal suffusion of fuscous or brownish which extends along costa but not to apex of second vein and more or less gradually shades off into the hyaline posterior portion of wing. 7.
7. Mid and usually also fore femora each with one or two short black bristles at apex behind; wings rather conspicuously browned basally, the dark color extending along costa to slightly beyond middle ... *varius*.
Mid and fore femora without a bristle at apex behind. 8.
8. Proboscis about as long as body of insect including head; hairs along upper margin of pleura in front of wings much darker than those on margin of mesonotum 9.
Proboscis shorter than entire body; hairs along upper margin of pleura in front of wings not darker than those on margin of mesonotum; body pile mostly yellowish, no pale patches; wing with a brownish cloud covering entire base and extending to middle along costa ... *fulvibasis*.
9. Pile of dorsum yellow; wings marked as in *fulvibasis*..... *validus*.¹
Pile of dorsum chiefly dark, with white patches on thorax and abdomen; wing clouding similar to that of preceding two species, but blackish.

azaleae.

B. ater Coquillett (*Parabombylius* Coq.).—Beltsville, Md., July 4, 1912, McAtee.

B. azaleae Shannon.—A common visitant to the flowers of Azalea including both *A. nudiflora* and *A. viscosa* in Coastal Plain localities; the extreme dates of collection are May 5 and July 4.

B. fraudulentus Johnson.—Bladensburg, Md., June 23, 1916, R. C. Shannon; Branchville to Beltsville, Md., June 4, 1914, L. O. Jackson; Beltsville, Md., June 25, R. C. Shannon; July 2, 4, 1916, W. R. Walton, McAtee; July 9, Cole; Odenton, Md.,

¹An old specimen of *B. validus* Loew labelled Va. only, may be from our region; at any rate the species is to be expected here.

June 20, 1915, in copula, McAtee; Falls Church, Va., June 6, 1915, June 25, 1917, C. T. Greene.

B. fulvibasis Macquart.—Common, chiefly on the Coastal Plain; has been collected at dates ranging from May 19 to July 4; visits flowers of *Ceanothus* and *Xolisma*.

B. incanus Johnson.—Has been taken only at Bladensburg, Beltsville, and Odenton, rather plentifully, however, at the intermediate locality; season June 9 to July 20; frequents flowers of *Xolisma* and is fond of resting on sandy roads.

B. major Linnaeus.—The most common and widely distributed species of the genus; it is also the earliest species of the family to appear in spring; extreme dates of collection are: March 13 and June 10; visits flowers of apparently every kind in bloom during its season. P. I.

B. pulchellus Loew.—Mt. Vernon, Va., April 28, 1918; Maywood, Va., April 27, 1919; Bladensburg, Md., April 19, 1914, on flowers of *Houstonia caerulea*; Beltsville, Md., May 31, 1920, McAtee; Brookland, D. C., May 3, 1916, Parker.

B. pygmaeus Fabricius.—Falls Church, Va., May 1, N. Banks; Glencarlyn, Va., May 7, 1922; Maywood, Va., April 27, 1919, on flowers of *Vaccinium*, McAtee; Dyke, Va., April 26, 1913, W. D. Appel; Brookland, D. C., May 3, 1916; Parker; Odenton, Md., May 5, 1918, on flowers of *Potentilla quinquefolia* and *Vaccinium corymbosum*, McAtee.

B. varius Fabricius (United States specimens sometimes misidentified as *B. mexicanus* Wied.).—Common, mostly in Coastal Plain localities; season May 25 to July 9; in copula, July 4; visits flowers of *Ceanothus*, *Xolisma*, and *Azalea*. V. P. I.

Genus **SYSTOECHUS** Loew.

S. vulgaris Loew.—Beltsville, Md., Sept. 3, 1916, McAtee.

Genus **ANISOTAMIA** Macquart.

Ogcodocera Macquart.

A. leucoprocta Wiedemann.—Falls Church, Va., June 16, 1915, on flowers of *Ceanothus*, C. T. Greene; Barcroft, Va., June 17, 1917, on flowers of *Ceanothus*; Beltsville, Md., June 15, 1913, McAtee; Bladensburg, Md., June 23, 1916, R. C. Shannon.

Genus **PHTHIRIA** Meigen.

Key to the species.

1. A faint cross-vein present near apex of auxiliary vein connecting it with first vein; a line drawn obliquely from apex of second vein to upper outer angle of discal cell would bisect cell enclosed within fork of third vein near its base; cross-veins in disc of wing narrowly clouded; third antennal segment not three times as long as its greatest width.....*sulphurea*.

No cross-vein between auxiliary and first veins; a line drawn obliquely from apex of second vein to upper outer angle of discal cell would pass clear of base of cell formed by fork of third vein; no clouds on cross-veins; third antennal segment over three times as long as its greatest width.....
coquilletti.

P. coquilletti Johnson.—Maryland near Plummers Id., July 12, 1913, R. C. Shannon.

P. sulphurea Loew.—Odenton, Md., June 11, 1922, McAtee.

Genus **LEPIDOPHORA** Westwood.

L. aegeriiformis Westwood.—Beltsville, Md., Sept. 3, 10, 1916, McAtee; these were sitting on a telephone pole near a marshy creek bed.

Genus **SPARNOPOLIUS** Loew.

S. fulvus Wiedemann.—A common autumn bee-fly frequenting the flowers of *Chrysopsis mariana*; dates of collection range from Aug. 20 to Oct. 30; in copula, Sept. 21, 23. P. I.

Genus **SYSTROPUS** Wiedemann.

S. macer Loew.—An autumnal species, season Aug. 28 to Oct. 30; usually found in numbers together about flowers.

Genus **METACOSMUS** Coquillett.

M. mancipennis Coquillett.—Difficult Run, Va., July 7, 1915, R. C. Shannon; Chain Bridge, Va., June 23, 1913, C. T. Greene; Beltsville, Md., July 4, 1916, W. R. Walton. On the latter date these little Pipunculus-like flies were common and all apparently pairing.

Genus **GERON** Meigen.

Key to the species.

1. Section of third vein beyond base of fork much shorter than the section in front of it, the cell within the fork wide, distance between apices of veins forming fork measured along margin of wing exceeding the length of the section between fork and second vein; femora black; frons of female wide, black, whitish on sides and in front, with yellow pile in center and whitish hairs on sides.....*subauratus*.

Section of third vein beyond base of fork not shorter than the section in front of it, the cell within the fork long and narrow, distance between apices of veins forming fork not exceeding that between fork and second vein; femora largely yellowish; frons of female narrow, white plumose, with a few short decumbent whitish hairs.....*calvus*.

G. calvus Loew.—Difficult Run, Va., July 7, 1915, on *Ceanothus*, Dead Run, Va., June 22, 1915, R. C. Shannon; New Alexandria, Va., July, 1907, Wm. Palmer; Falls Church, Va., July, 1915, Cole; Glen Echo, Md., July 9, 1922, Malloch; Riverdale, Md., June 5, 1915; Beltsville, Md., July 9, 1916, Cole; July 4, 9, 1916, McAtee; June 25, 1915; Bladensburg, Md., June 23, 1916, R. C. Shannon.

G. subauratus Loew.—This is the more common and generally distributed species; season June 18 to Sept. 23; visits numerous kinds of flowers. V. P. I. The genitalia are of the type described for *G. digitaria* Cresson (1919, pp. 184-5). Cresson records from Linnieville, Md., July (R. C. Shannon), a variety of his *G. nivea* (l. c. p. 185).

Genus **TOXOPHORA** Meigen.

T. amphitea Walker.—Common; has been collected at dates ranging from May 23 to Sept. 23; visits many kinds of flowers. A pupal skin and adult were found in a bee's nest at Licking Banks, D. C., Nov. 27, 1914, H. S. Barber. P. I.

Genus **RHABDOSELAPHUS** Bigot.

R. sigma Coquillett.—A series of specimens was taken by Cole in East Riverdale, Md., March 25, 1917. These are only 2.25 to 3 mm. in length as compared to western specimens 3.75 to 4 mm. in length. The proboscis is shorter than in the western material examined, but otherwise the specimens are structurally the same. These little flies are among the first to brave the spring weather and were locally quite abundant in 1917. Other local records are Berwyn, Md., April 1, 1917, and Beltsville, Md., April 2, 1917, McAtee. In all these cases the insects were collected from telephone poles. At Widewater, Va., April 2, 1916, McAtee took the species on flowers of *Salix tristis*.

Genus **PACHYNERES** Greene.

P. crassicornis Greene.—Originally described from specimens reared from a decaying tree of *Quercus velutina* in the grounds of the Soldiers Home, Washington, D. C. (April 15-20, 1923, Miss E. F. Myers), and others obtained in Manitoba and Pennsylvania. A species of this genus occurs in New South Wales, Australia also, but no others are as yet known.

Family **THEREVIDAE**.

The members of this family resemble some of the Asilidae in general habitus, and especially some Dasypogoninae, but the vertex of the head is never sunken as in the members of that family nor do the eyes bulge out so much on the sides. The flies occur most commonly in sandy areas and are fond of settling on the bare sand in the sunshine, though they occur also on flowers. They are recorded as being predacious, but the record requires confirmation. The larvae that are known feed on coleopterous larvae, some of them doing considerable good by destroying the larvae of Elateridae, and Malloch has found a species feeding upon coleopterous larvae in a hollow, much-decayed apple tree. Therevidae are rare in the east but some occur quite commonly in the Western States.

Key to the genera.

1. Sides of face with long erect pile between lower margin of eye and base of antenna.....*Thereva*.
Sides of face bare between lower margin of eye and base of antenna2.
2. Prosternum hairy between bases of fore coxae; wings not fasciate
Psilocephala.
Prosternum bare between bases of fore coxae; wings usually fasciate with fuscous.....*Epomyia*.

Genus **PSILOCEPHALA** Zetterstedt.*Key to the species.*

1. Halteres brownish yellow; hairs on dorsum of thorax golden yellow, the disc without a dark median vitta; hairs on the male hypopygium all yellow*flavipennis*.
Halteres fuscous or black; hairs on dorsum of thorax in male mostly white, in female yellowish mixed with black, both sexes with a distinct black opaque dorsocentral vitta; male hypopygium with some black hairs2.
2. Hairs on sternite forming basal ventral portion of male hypopygium whitish, only a tuft on each inner apical angle black; silvery pruinescence on each side of frons in female carried in the form of a narrow lateral stripe above bases of antennae, not forming a triangle*frontalis*.
Hairs on most of disc of sternite forming basal ventral portion of hypopygium black, no tuft of black hairs on each apical angle; silvery pruinescence forming a triangle on each side of frons above bases of antennae.....*haemorrhoidalis*.

P. flavipennis Cole.—Cupid's Bower, Id., Md., July 8; Plummers Id., Md., July 14, Aug. 3, at light, R. C. Shannon; Falls Church, Va., July 13, 1912, C. T. Greene; July 13, 1913, F. Knab; July 17, 25, N. Banks.

P. frontalis Cole.—Falls Church, Va., Aug. 15, 1913, C. T. Greene.

P. haemorrhoidalis Macquart.—The most common species of the family; it is of general distribution and has been collected from June 14 to Sept. 2; comes to light, and is attracted to honey dew. An active larva collected in sand on Plummers Id., Md., May 5, 1914, by R. C. Shannon, had transformed and emerged as an adult by May 5.

Genus **EPOMYIA** Cole.*Key to the species.*

1. Scutellum red, narrowly black at base.....*scutellaris*.
Scutellum black.....2.
2. Scutellar pile yellowish or whitish along hind margin; abdomen usually entirely or largely reddish.....*rufiventris*.
Scutellar pile black; abdomen black, male hypopygium yellowish.....*pictipennis*.

E. pictipennis Wiedemann.—Maryland near Plummers Id., June 29, 1913, June 20, 1916; Bladensburg, Md., June 23; R. C. Shannon; Beltsville, Md., June 15, 1913, McAtee.

E. rufiventris Loew.—Maryland near Plummers Id., June 29, 1913, R. C. Shannon; Beltsville, Md., May 28, 1916, June 14, 1914, McAtee; June 9, N. Banks; June 28, 1917, L. O. Jackson; July 1, 1911, J. D. Hood.

E. scutellaris Loew.—Plummers Id., Md., June 15, 1903, A. Busck; Lakeland, Md., June 25, 1906, D. H. Clemons.

Genus **THEREVA** Latreille.

Key to the species.

1. Frons with two distinct round velvety black spots *bimaculata*.
Frons with a dark crossband *candidata*.

T. bimaculata Cole.—Falls Church, Va., May 18, 1917, C. T. Greene.

T. candidata Loew.—Eleven records, all from Piedmont localities; dates range from May 30 to Aug. 6. P. I.

Family SCENOPINIDAE.

Of the genera of this family some have clung to the original habitat where their larvae have been found in decaying fungi and wood, but members of one genus, *Scenopinus*, have become almost solely house inhabitants. Their larvae are reported to be carnivorous and to prey upon clothes-moths among other things; the slug-like and slow-moving adults are seen more frequently on windows than elsewhere, and are called window flies.

Key to the genera.

1. First posterior cell open *Scenopinus*.
First posterior cell closed before margin of wing *Metatrichia*.

Genus **METATRICHIA** Coquillett

M. bulbosa Osten Sacken.—Washington, D. C., June 19, 1914, P. R. Myers; Vietch to Torrison, Va.; July 18, 1915; Mt. Vernon, Va., July 4, 1917, on flowers of *Sericocarpus linifolius*, McAtee.

Genus **SCENOPINUS** Latreille.

Key to the species.

1. Frons polished, bluish black *fenestralis*.
Frons more or less granular, greenish-black *glabrifrons*.

S. fenestralis Linnaeus.—Fairly common; dates of collection range from May 7 to Aug. 15; comes to light. P. I.

S. glabrifrons Meigen.—All records (8 in number) are for the city of Washington, and at dates between May 20 and Sept. 23, inclusive.

SUMMARY.

A comparison of the District of Columbia representation of

the four families here treated with that reported for New Jersey (Ann. Rep. N. J. State Museum (1909) 1910, pp. 744-748) is given in the following tabulation. For convenience of local students the number of species collected on Plummers Id. (P. I.) and additional ones in the vicinity (V. P. I.) also are included.

Family	Number of Species.			
	N. J.	D. C.	P. I.	V. P. I.
CYRTIDAE	5	9	3	1
BOMBYLIIDAE	40 ¹	37	12	10
THEREVIDAE	9	8	4	2
SCENOPINIDAE	2	3	1	—
Totals	56	57	20	13

The slight superiority of New Jersey as a collecting place for Bombyliidae no doubt is correlated with the greater proportion of sandy country in that State. Bee-flies love sand. Locally this statement is strongly exemplified by the preeminence of the sandy Beltsville region as a habitat for these flies; of the 37 species of Bombyliids known from the District of Columbia region, 33 have been collected near Beltsville.

Species of the various families not yet collected here, that may reasonably be expected are: Cyrtidae, *Opsebius gagatinus* Loew; Bombyliidae, *Exoprosopa fasciata* Macquart, *Anthrax tegminipennis* Say, *Bombylius atriceps* Loew, *B. validus* Loew, *Anastoechus barbatus* Osten Sacken; Therevidae, *Tabuda fulvipes* Walker, *Psilocephala morata* Coquillett; and Scenopinidae, *Scenopinus nubilipes* Say.

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Acrocera unguiculata Westwood (p. 54), *Ogcodes incultus* Osten Sacken (p. 63), and *O. dispar* Macquart (p. 66) recorded from the District of Columbia region.

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Six species, one new, represented by specimens of local origin.

¹Synonyms as given in this paper deducted.

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Pupa of *Spogostylum simson* Fabr. (393–4) described from a local specimen.

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Bombylius azaleae n. sp. described chiefly from local material.

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CHANGE OF PREOCCUPIED NAMES.

By J. M. ALDRICH AND RAY T. WEBBER.

In the paper on *Phorocera* and Allied Genera by us in Proceedings U. S. N. M., vol. 63, Article 17, issued Feb. 29, 1924, two preoccupied names were used. For *Phorocera tenuiseta* A. & W. (not of Macquart, 1846) we now propose the name *Phorocera victoria*; and for *Phorocera xanthura* A. & W. (not of Van der Wulp, 1890) we propose *Phorocera nitelae*.

A NEW MOTH OF THE SUBFAMILY PHYCITINAE.

By W. SCHAUS.

Epischnia parkerella, new species.

Male.—Palpi white laterally mottled with gray and black. Head and throat white; neck behind, collar and thorax olive buff. Abdomen above pearl gray, the three basal segments with olive buff band, the following segments with narrower white segmental bands; anal segment olive buff, laterally and underneath white. Legs mostly white finely irrorated with drab gray, the fore tibiae fuscous black, the tarsi white. Fore wing olive buff, the costa and inner margin white, the former with a few minute dark irrorations; the subcostal vein on basal half more thickly irrorated with black, forming a small antemedial streak, and a similar short streak on vein 1, slightly outset, the two connected by a very faint dusky oblique shade; a few black scales at upper and lower angle of cell; a pale olive buff shade from costa near apex, inbent to vein 2 then outbent, defined proximally by a deep olive buff narrow shade and some black scales on costa; distally a few black scales on costa and the terminal olive buff ground color: termen narrowly and diffusely pearl gray with small clusters of black scales on interspaces; cilia pearl gray at base with some black scales, then whitish with a dark line at tips. Hind wing suffused with mouse gray; a fine dark line at termen; cilia white with a dark line close to base. Fore wing below with smoky suffusions on disc and a white line on discocellular. Hind wing below whitish with faint dark suffusions except on termen.

The two female specimens received are rather different; one is like the male but has a white antemedial outcurved line connected with the outer line by more extended white medially above vein 1; the outer line is white and distinct, outbent at vein 2 as in the male.

The other female has the wing from below costa thickly irrorated with deep neutral gray and white, with only faint traces of olive buff; the antemedial line is whitish, distally defined by darker shading on both sides. The fore tibiae are almost entirely white in both females.

Expanse.—Male 32 mm.; female 30–32 mm.

Type.—Cat No. 27356, U. S. N. M.

Habitat.—Bozeman, Montana.

Described from male type, one male and two female paratypes reared from "loco" July 10 and 15, 1924, and received from J. R. Parker, Associate Entomologist of the Montana Agricultural Experiment Station.

A CORRECTION.

By THOS. E. SNYDER, U. S. Bureau of Entomology.

Through a typographical error, the termite described in "A New Subgenus of *Nasutitermes* Banks (Isoptera)," Proceedings of the Entomological Society of Washington, vol. 26, no. 1, pp. 20–22, 1924, namely, *Nasutitermes* (*Obtusitermes*) *biforma* Snyder, the ending *is* was printed as *a* (*biforma* instead of *biformis*). I take this opportunity of changing the name of this species to *Nasutitermes* (*Obtusitermes*) *biformis*.

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THE LIFE HISTORY AND STAGES OF CIMOLUS OBSCURUS
STAL (HEMIPTERA).

BY THOS. H. JONES, formerly Entomologist, Louisiana Agricultural
Experiment Stations.

In December of 1916 the writer took a specimen of a coreid bug under a log on batture land of the Mississippi River near Baton Rouge, La. Other individuals were found in similar situations during January, February, and March of the four subsequent years. As the writer was not acquainted with the species specimens were sent to Mr. H. G. Barber and he identified them as *Cimolus obscurus* Stal. Thanks are due Mr. Barber for his kindness in determining specimens sent him and for the assistance he has given in the preparation of this paper.

It was not until July of 1920 that any knowledge of the food-plant of the bug was obtained. On July 26, 1920, an adult, several nymphs, and a cluster of eggs from which nymphs had issued were found on and beneath a wild cucurbit vine. This plant was later determined by Dr. S. F. Blake of the U. S. Bureau of Plant Industry as the creeping cucumber, *Melothria pendula* L. This is the only plant upon which the insect has been found breeding though other wild and cultivated cucurbits, upon which species of the closely allied genus *Anasa* feed, have been carefully examined from time to time.

Since its food-plant was ascertained the various stages of the bug have been quite easily obtained in the field and it has been carried through its various stages on this plant in confinement. Dr. J. K. Small, in his *Flora of the Southeastern United States*, states that *Melothria pendula* grows in swamps and light soil from "Pennsylvania to Missouri, Florida, Texas, and Mexico." At Baton Rouge it is quite commonly found on open land, usually occurring among a growth of grass, vines, or shrubs.

DISTRIBUTION.

Stal, in connection with his original description of the species,¹ mentions its occurrence in Texas and South Carolina. It appears that since then no additional information regarding its

¹Stal, Carl. Enum. Hem., I, p. 189. 1870.

distribution has appeared in the literature. All specimens seen by the writer have been collected in the vicinity of Baton Rouge.

DESCRIPTION OF STAGES.

THE ADULT.

The original description by Stal is as follows:

"Griseo-flavescens, supra infuscatus, sat dense nigropunctatus, punctis nigro-cinctis; antennis, vitta latissima capitis, membrana, dorso abdominis, connexivo, maculis duabus marginalibus segmentorum ventris, interdum in unam majorem confluentibus, maculis parvis lateralibus ventris in seriem dispositis, pedibusque nigris, his articuloque primo antennarum obsolete pallido-conspersis; alis fuscis; linea longitudinali anteriore marginibusque lateralibus anticis thoracis obsolete pallescentibus, his nigro-subgranulatis, ante medium obsolete denticulatis, angulis anticis in dentem prominulis; maculis minutis duabus marginalibus margineque basali segmentorum connexivi griseo-flavescens; macula basali media membranae sordide albida, parva. ♂ Long. 13, Lat. 5 mill.

"Patria: Texas, Carolina meridionalis. (Mus. Holm.)

"*C. vitticipiti* maxime affinis, differt praesertim thoracis marginibus lateralibus nigro-granulatis et multo minus distincte denticulatis. Pectus remote punctatum, punctis ad coxas sitis nigris, macula media laterum mesostethii et metastethii laevi. Venter plus minus distincte fusco-varius, obsolete punctulatus."

The adult, as well as the egg and nymphal stages, resembles in a general way that of various species of *Anasa*. As has been mentioned by Fracker,¹ the adult may be separated from *Anasa* adults by the length of the rostrum. In the genus *Cimolus* the rostrum is short, scarcely surpassing the anterior coxae, and the first segment does not extend behind the eyes. In *Anasa* the rostrum is longer, attaining or surpassing the intermediate coxae, and the first segment surpasses the posterior margin of the eyes.

The adult, egg, and the five nymphal stages are shown in the accompanying illustrations made from photographs of specimens collected at Baton Rouge.

In color the adult very much resembles the form of *Anasa tristis* DeG. found in the Eastern United States. The ground color of the head, thorax, abdomen, and appendages, except the dorsal surface of the abdomen and the membranous portions of the primaries and all of the secondaries, is of a yellowish or grayish brown. On the relative abundance of the small black tubercles, from which arise short setae, occurring on all but the portions excepted in the previous sentence, depends the shade of color of these parts. Because of this the dorsal surface of the insect, with wings folded, is dark brownish or black, whereas the ventral surface is noticeably lighter in color.

¹Fracker, S. B. A review of the North American Coreini (Heteroptera). In Anns. Ent. Soc. Am., Vol. XVI, No. 2, p. 165-173, 1 fig., pl. X. 1923.

Measurements of five mounted male specimens gave an average length of 12.4 mm., an average width of thorax of 4.6 mm., and an average width of abdomen of 5.5 mm. Five females had an average length of 13.8 mm., an average width of thorax of 5.1 mm., and an average width of abdomen of 5.8 mm. The spine above the base of the antenna is about 0.15 mm. long.

THE EGG.

The egg resembles a miniature mussel shell in shape. It is flattened on three sides, being triangular in outline when viewed from either end. Viewed from above it is nearly elliptical in outline and when viewed from the side it approaches a semicircle in outline, being rounded above and flattened below. Near the center of the under surface there is a small projection by which the egg is attached to the surface upon which it is placed.

The surface of the egg is glistening. Under the microscope it is seen to be delicately reticulated and divided into hexagonal areas. There are about 14 chorial processes. When first laid the egg is whitish but later becomes darker and finally reddish brown.

Five eggs gave an average length of 1.7 mm., an average width of 1.1 mm., and an average height of 1.0 mm.

NYMPHAL STAGES.

First Stage.—Head glistening black. Eyes dark reddish brown. Antennae glistening black; with 2d and 3d joints flattened, others cylindrical. Beak for the most part light in color, but dusky at base and tip. Thorax; except for small, light green, central area on posterior dorsal surface, and larger central area of same color on posterior ventral surface, glistening black. Legs glistening black. Abdomen glistening, sides and apex dark purplish, two dorsal tubercles yellowish, remainder light green. Surface of body, antennae, and legs have numerous tubercles, bearing black setae. Abdominal segments 3 to 7, inclusive, each have two prominent black tubercles, one on either side margin, pointing outward and upward, each bearing a black seta. Length about 2.0 mm. (In connection with the length the measurements given for all stages are for individuals that have recently entered the instar, but are fully colored. There is little increase in length simply because of molting; the greater part of the increase in size coming during the instar.)

Second Stage.—Head, thorax, and abdomen dull, not glistening as in first stage. Covered with "bloom" that gives them a light gray color. With this removed color is much as in first stage. Lateral abdominal tubercles differ from those of first stage. These are now noticeable on segments 1 to 7, inclusive; those on segments 4 to 7, inclusive, largest and of about equal size. Of those tubercles on segments 1 to 3, inclusive, those on segment 1 are smallest and those on segment 3 largest. Besides the apical setae the tubercles on segments 3 to 7, inclusive, bear setae on their sides. Between each two of the tubercles there is a smaller one bearing a seta at its apex. Length about 3.0 mm.

Third Stage.—Differs little from 2d stage. Thorax now shows developing wing-pads and the tubercles on the sides of the abdomen are somewhat less prominent than in the 2d stage. Color of the thorax and abdomen, when

"bloom" is removed, of a greenish gray, the thorax being the darker, and with the numerous tubercles over the surface showing as darker spots. Length about 4.5 mm.

Fourth Stage.—Differs considerably from 3d stage. The wing-pads are better developed and the tubercles on the sides of the abdomen less noticeable. The general color of head, thorax, and abdomen is usually of a darker gray, mixed with light yellow; the light yellow prevailing along the sides of the thorax and abdomen. The ventral surface of the body is darker than the dorsal. Antennae and legs have lost their glistening appearance, due to their now having "bloom" on them, and are dull, dark gray. Head, thorax, abdomen, antennae, and legs are thickly dotted with small black tubercles from which arise short setae. Length about 7.0 mm.

Fifth Stage.—The coloration of this stage is usually somewhat darker than that of the 4th, the "bloom" not being so noticeable. The main differences between it and the 4th are, however, that the wing-pads are still further developed and the tubercles on the sides of the abdomen have disappeared. The spine on the head is also now apparent. The 2d and 3d antennal joints, which have become less flattened with each succeeding molt, are now nearly cylindrical. Length about 11.0 mm.

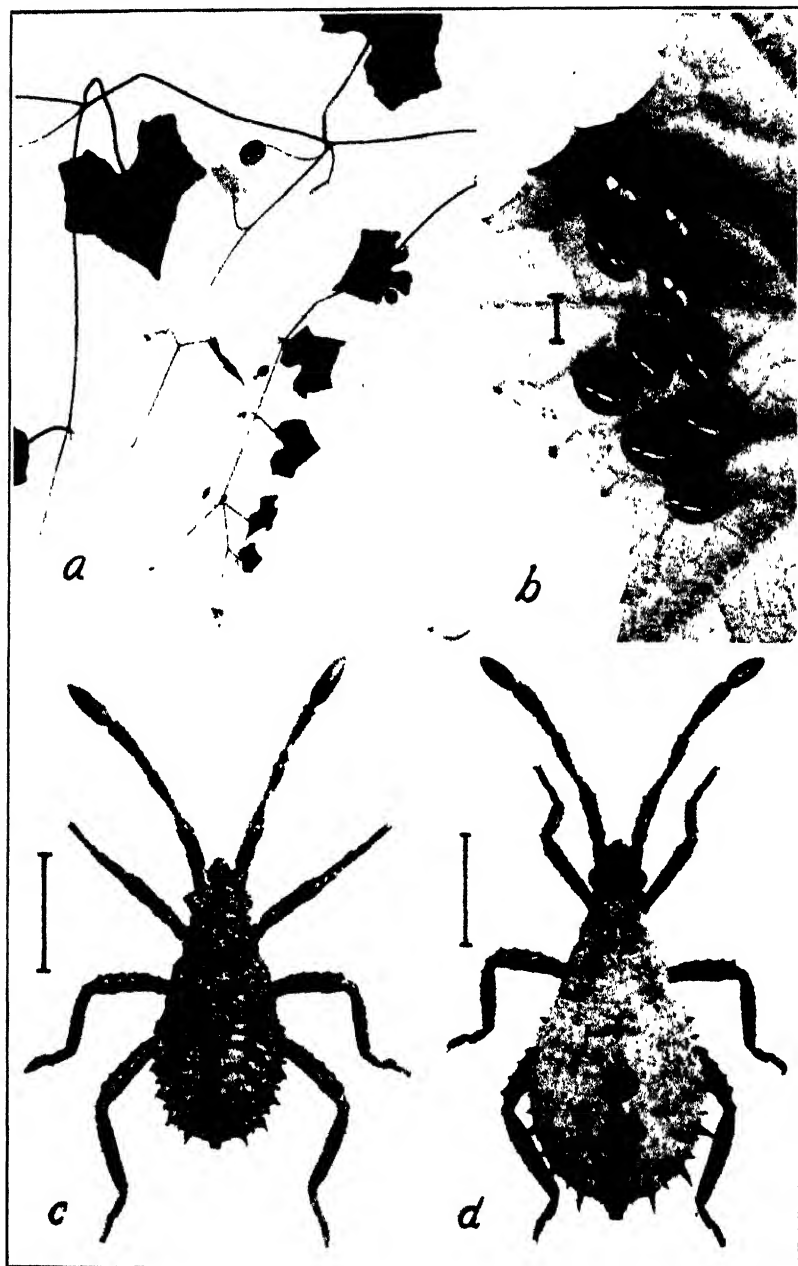
LIFE HISTORY AND HABITS.

The winter is passed at Baton Rouge in the adult stage. From December to March, inclusive, adults have been found hibernating under bark and under logs. Adults have been noted on plants of *Melothria pendula* in the field from April to November, inclusive.

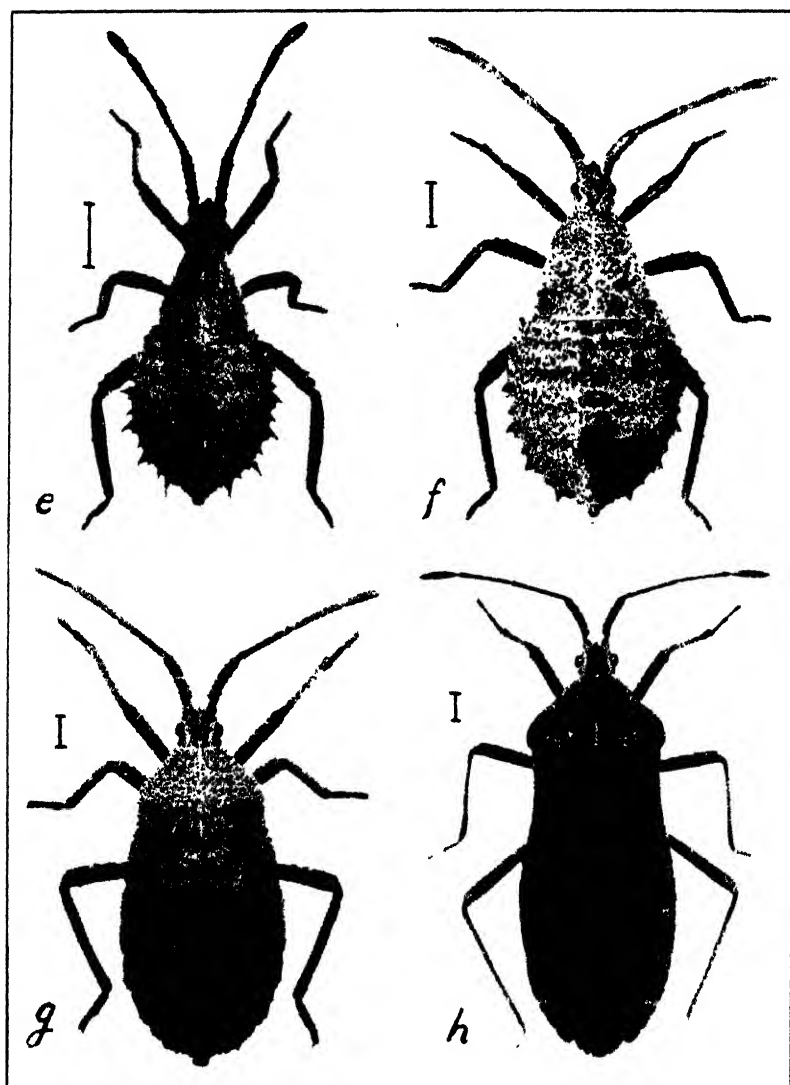
The eggs are usually laid on the under sides of the leaves of the host plant, though they may be placed on other parts of the plant or on objects nearby. They are deposited rather close together in irregular groups. Eighteen egg-clusters contained an average of 12 eggs, ranging from 7 to 23 eggs per cluster.

The first-stage nymph apparently does not feed, but nymphs in the later stages, as well as the adults, have been observed feeding on the stems and fruit of *Melothria pendula*. While they are often common on and about this plant no noticeable injury that could be ascribed to their feeding has been noted.

The number of generations that develop during a year has not been ascertained. A third-stage nymph has been found in the field as early as May 16 and a fourth-stage nymph as late as October 5. The following table gives results relative to the length of egg and nymphal stages obtained in outdoor cages during 1921; the nymphs being reared on growing plants of *Melothria pendula*.



JONES-CIMOLUS OBSCURUS



JONES CIMOLUS OBSCURUS

TABLE

Showing length of instars, based on record for first individual.

Eggs laid	Eggs hatched	Second instar	Third instar	Fourth instar	Fifth instar	Adult
Date not noted	May 23	May 26	June 1	June 7	June 13	June 21
June 11	June 22	June 25	July 1	July 4	July 11	July 21
June 16	June 27	June 29	July 4	July 10	July 16	July 25

EXPLANATION OF PLATES 9, 10.

Plate 9. a--Sprig of *Melothria pendula*. Food-plant of *Cimolus obscurus*. Reduced.

b--Egg-cluster of *Cimolus obscurus* on under side of leaf of *Melothria pendula*.

c--Nymph of *Cimolus obscurus* in first instar.

d--Nymph of *Cimolus obscurus* in second instar.

Lines beside egg-cluster and nymphs represent a millimeter enlarged in same proportion as the egg-cluster and nymphs.

Plate 10. e--Nymph of *Cimolus obscurus* in third instar.

f--Nymph of *Cimolus obscurus* in fourth instar.

g--Nymph of *Cimolus obscurus* in fifth instar.

h--Adult of *Cimolus obscurus*.

Lines beside nymphs and adult represent a millimeter enlarged in same proportion as the nymphs and adult.

NOTES ON THE GENUS NOCTUELIA. (LEPIDOPTERA: PYRALIDAE.)

By WM. BARNES AND F. H. BENJAMIN, Decatur, Illinois.

Genus **NOCTUELIA** Guenée.

Genotype **Cynaeda superbalis** H.-S.

1854, Guenée, Spec. Gén., VIII, Delt. & Pyral., p. 113, *superbalis* sole species and therefore type.

1899, Hampson, Proc. Zool. Soc. Lond., p. 278, type designated *superba* (*mel-axantha*), presumably in place of the Herrich-Schaeffer synonymic name evidently considered unavailable. *Aporades* Gn., *Aporocosmus* Butl., *Semnomima* Warr., *Minioschinia* Warr., listed as synonyms.

Noctuella rhea Druce.

1898, Druce, Biol. Centr.-Amer., Het., II, 490, pl. XCIV, f. 23, *Panemeria*.

Described from Durango City, Mexico, as a Phalaenid (Noctuid) close to *Anarta*. Two specimens are in the Barnes

Collection from the Baboquivari Mts., Pima Co., Ariz. (O. C. Poling), 1-15 and 15-30 Sept., 1923.

Mr. Schaus possesses a specimen labeled by Hampson *Noctuelia rhea* Druce.

The species does not fit well with the North American forms assigned to the genus *Noctuelia*, but the differences are not great, and no other genus appears to be available.

***Noctuelia unicoloralis* Barnes & McDunnough.**

1914, Barnes and McDunnough, Contr. N. H. Lep. N. A., II, (6), 244, pl. II, f. 15, *Heliothela*.

Appears to be strictly congeneric with *rhea*, and not a *Heliothela*.

***Noctuelia costipunctalis* Barnes & McDunnough.**

1914, Barnes and McDunnough, Contr. N. H. Lep. N. A., II, (6), 244, pl. II, f. 14, *Heliothela*.

This species still further diverges from the bulk of North American *Noctuelia*, but apparently is not a *Heliothela*. Temporarily it may be placed in *Noctuelia*. This eliminates the genus *Heliothela* from our lists.

***Noctuelia achemonalis pulcharalis* new subspecies.**

Entirely similar to *achemonalis achemonalis* (1914, B. & McD., Contrib. N. H. Lep. N. A., II, (6), 243, pl. II, f. 12), but with the basal pink area so extended over the primary as to leave only a narrow band of ochreous.

Forty specimens of typical *achemonalis* are before the authors, with the exception of one New Mexican specimen, all from Arizona.

A single female "cotype" of *achemonalis* is referable to *pulcharalis*. It is the only New Mexican specimen mentioned in the original description, which, in order to include it, reads: "In some specimens the basal pink area extends over half the wing leaving only a narrow band of ochreous."

Type localities and number and sexes of types: Holotype ♂, N. Mex., 24-30 Aug.; Allotype ♀, (cotype of *achemonalis*), Deming, N. Mex., 1-7 Sept.; 2 ♂ Paratypes, So. N. Mex., 23-30 Aug., (O. C. Poling), and San Bernadino Ranch, Cochise Co., Ariz., 3750 ft. (F. R. Snow).

A NON-SUBTERRANEAN TERMITE IN VIRGINIA.

By THOS. E. SNYDER, U. S. Bureau of Entomology, Washington, D. C.

Species in the genus *Kaloterme*s Hagen are of southern distribution, wherever they occur. In the United States, they commonly occur in Florida, Georgia, Texas, Arizona, and California; in the eastern section of this country the light colored *K. marginipennis* Latreille has been found by the writer as far north as Charleston, S. C., where in 1922 it was found damaging cedar telegraph poles in the city. *K. marginipennis* until 1922 had not been recorded as occurring farther north than Savannah, Ga., where it is injurious to telephone and telegraph poles. On the Pacific Coast, *Kaloterme*s *minor* Hagen occurs as far north as San Francisco and Oakland, Cal.

In consequence, it was of great interest to the writer, when on April 7, 1923, H. S. Barber found a dark colored dealated adult of a species of *Kaloterme*s in a dead bald cypress tree (*Taxodium distichum*), associated with *Trachykele lecontei* Gory, at Cape Henry, Va., at the base of the sand dunes in "the desert."

This dark colored dealated *Kaloterme*s, found at Cape Henry, Va., differed from other American species of *Kaloterme*s and I believed it to be a new species. Since only one specimen had been collected, however, I desired more material before describing it as new and on December 15 and 16, 1923, the writer was fortunate enough to find one soldier of *Kaloterme*s in a dead standing bald cypress tree with the bark on; this tree was in the process of being covered over by the sand dunes. This proved to be *K. approximatus* Snyder, which had been described in 1920 from the soldier caste alone and had previously only been found in northern Florida. As yet the species does not appear to be common and the impressed pellets of excrement characteristic of its work was found in only a few dead cypress trees, all on the steep back slope of the highest dunes, where the slope is at an angle of nearly 45°. Colonies evidently pass the winter in the interior of wood and had left the outer layers of the wood of these trees.

It is exceedingly interesting to find this termite *K. approximatus* Snyder at Cape Henry, Va., the desert region with its forest of cypress, tupelo gum, magnolia, holly, etc., and the tangle of vines, including yellow jessamine, are characteristic of the flora of Florida. Many tree branches are covered with resurrection fern and mistletoe is common on the gum trees. There is Spanish moss on some of the live oak trees.

Fortunately, as yet, this termite is apparently not damaging telephone or other poles and woodwork.

These non-subterranean termites of the genus *Kaloterme*s are destructive to the tops of poles, interior woodwork and furniture in buildings. Their presence in wood may be detected

by the impressed pellets of excrement which they expel from infested wood and the small entrance holes about the size of BB shot. They do not require as much moisture for life as do species of our common native *Reticulitermes* Holmgren.

Where species of *Kaloterms* are common and injurious, the telephone poles, etc., must be impregnated with coal tar creosote for their entire length; since these termites do not necessarily attack the bases of the poles from the ground. Insulation of untreated wood from the ground will not protect the woodwork of buildings from attack by *Kaloterms*, as in the case with *Reticulitermes*. Woodwork must be impregnated with preservatives.

A description of the dealated adult is herewith appended.

***Kaloterms approximatus* Snyder.**

Dealated adult.—Head dark castaneous brown, oblong, slightly longer than broad, rounded posteriorly with fairly dense, long light-yellow hairs. Eyes black, oblong, small, not projecting, separated from the lateral margin of head by a distance equal to their diameter. Ocelli hyaline, white, small, suboval, separated from the eyes by a distance less than their diameter. Labrum pale yellow, much broader than long, narrowed and broadly rounded anteriorly, with long hairs.

Antenna pale yellow, 11 segments (broken) with long hairs; third segment slightly darker—light yellow brown, subclavate, longer than second or fourth segment; the following segments are wedge-shaped and become longer and broader towards the apex.

Pronotum castaneous-brown, not twice as broad as long, widest in middle, roundedly emarginate anteriorly and posteriorly, sides slightly and roundedly slope (narrowed) towards posterior margin; two black slanting linear converging depressions near anterior margin, margins with numerous long hairs.

Wing scale dark-brown, longer than pronotum, with long hairs.

Legs yellow, pubescent, tibiae darker, swollen, spines yellow-brown, pulvillus present.

Abdomen with tergites dark castaneous-brown, with a row of long hairs at the base of each tergite.

Measurements:

Length of entire dealated adult: 7.30 mm.

Length of head: 1.50 mm.

Length of pronotum: 0.90 mm.

Length of hind tibia: 0.95 mm.

Diam. of eye: 0.20 mm.

Width of head: 1.30 mm.

Width of pronotum: 1.60 mm.

K. approximatus Snyder is a dark colored, small eyed species; the eyes are smaller than in the light colored *K. marginipennis*

Latreille, but the pronotum is larger; the eyes are smaller than in *K. schwarzi* Banks; the ocellus is smaller but the eye is larger than in the dark colored *K. minor* Hagen; the eyes, ocelli and pronotum are smaller than in *K. jouteli* Banks; the eyes and ocelli are smaller than in *K. banksi* Snyder.

Described from a single dealated adult collected by H. S. Barber in a dead bald cypress tree on the steep back slope of the high sand dunes (the desert) on April 7, 1923. A soldier collected at the same locality by T. E. Snyder on December 15, 1923, has been compared with the type from Ortega, Fla.

A COLLECTION OF FLEAS FROM THE ISLAND OF HAWAII.

By H. E. EWING, U. S. Bureau of Entomology.

Because of the paucity of the mammalian and terrestrial avian fauna of the Hawaiian Islands but few fleas have been taken there. Hence any records from these islands are of considerable interest from the standpoint of zoogeography. Also much economic importance attaches to the occurrence of fleas in these islands. The great influx of Asiatics into the territory and the geographical position of the Hawaiian Group in regard to the commerce of the Pacific exposes them to the constant menace of flea-borne diseases.

Recently the writer has received for determination a collection of fleas made on the Island of Hawaii during the years of 1922 and 1923 by C. E. Pemberton. The collection was sent in by O. H. Swezey, Entomologist of the Experiment Station of the Hawaiian Sugar Planters' Association. Five species are included which were taken from six different hosts. All of these fleas evidently have been introduced, and all are of economic importance, four of them being among the most injurious species of the whole order. The list is here given:

Order SIPHONAPTERA.

HUMAN FLEA (*Pulex irritans* Linnaeus).

HONOKAA.

From dog, *Canis familiaris* Linnaeus; 14 specimens collected Dec. 17, 1922.

ORIENTAL RAT FLEA (*Xenopsylla cheopis* Rothschild).

HONOKAA.

From *Rattus rattus* (variety?); 1 specimen collected Feb. 22, 1923.

From roof rat, *Rattus rattus alexandrinus* (Geoffroy); 1 specimen collected Nov. 21, 1922.

From brown rat, *Rattus norvegicus* (Erxleben); 2 specimens collected Nov. 23, 1922; 1 specimen collected Dec. 11, 1922; 2 specimens collected Feb. 22, 1923; 1 specimen collected Mar. 1, 1923.

CAT FLEA (*Ctenocephalus felis* (Bouché)).

HONOKAA.

From dog, *Canis familiaris* Linnaeus; 2 specimens collected Aug. 29, 1922; 1 specimen collected Dec. 17, 1922.

From mongoose, *Herpestes birmanicus* Thomas; 3 specimens collected Dec. 11, 1922; 1 specimen collected Jan. 22, 1923.

WAIPIO.

From cat, *Felis domestica* Linnaeus; 2 specimens collected at an elevation of 3800 ft. on Nov. 28, 1922.

MOUSE FLEA (*Ctenopsyllus musculi* (Dugés)).

HONOKAA.

From brown rat, *Rattus norvegicus* (Erxleben); 1 specimen collected Feb. 1, 1923.

From house mouse, *Mus musculus musculus* Linnaeus; 1 specimen collected Nov. 1, 1922; 4 specimens collected Nov. 23, 1922.

STICKTIGHT (*Echidnophaga gallinacea* (Westwood)).

HONOKAA.

From mongoose, *Herpestes birmanicus* Thomas; 1 specimen collected Dec. 11, 1922.

From dog, *Canis familiaris* Linnaeus; 3 specimens collected Mar. 10, 1923.

In this list it is interesting to note the presence of *Ctenocephalus felis* (Bouché) but the absence of *Ctenocephalus canis* (Curtis), also the presence of *Xenopsylla cheopis* Rothschild but the absence of *Ceratophyllus fasciatus* Bosc. The cat flea, *Ctenocephalus felis* (Bouché), is stated as occurring in many places in Eastern Asia and also in Polynesia while in most of this range the dog flea, *Ctenocephalus canis* (Curtis), is absent. Along the eastern seaboard of the United States the cat flea is found to predominate very greatly in the north central area and to be the only flea found in most sections in peninsular Florida, while in the central area, as represented by the states of Maryland and Virginia, it is the dog flea that occurs almost exclusively.

Jordan and Rothschild in their comprehensive paper on *Ceratophyllus fasciatus* and allied species, published in "Ectoparasites," 1921, give the world distribution of this rat flea including records for Yokohama and Tokio, for India and for Australia but none for the Hawaiian Islands. These authors described several new species from the Oriental Region which were closely related to *Ceratophyllus fasciatus*.

Mr. Swezey has consented to have the United States National Museum retain some of the slides he sent. The writer has picked out one of each species to be retained by the Museum. Three of these are lot duplicates and the other two, *Ctenopsyllus musculi* Dugés and *Echidnophaga gallinacea* (Westwood), are locality duplicates, though not lot duplicates.

A NEW SPECIES OF PSELLIOPUS (HEMIPTERA: REDUVIIDAE).

BY H. G. BARBER, *Roselle, N. J.****Pseliopus latifasciatus*, new species.**

Form rather broad. Sordid stramineous. Anterior lobe of head, with tylus, fascia running forward from between two small rounded black tubercles to the base of each antenna, a small spot between the eye and base of each antenna, posterior lobe with a broad lateral fascia running back from the eyes and connected near base of head with two broad somewhat crescentic fascia which run forward between the ocelli to connect at the transverse stricture, black; a somewhat quadrangular stramineous spot between the ocelli. Antenna colored as in *cinctus* with the second and fourth segments about equal in length. Pronotum, except for a short median longitudinal black fascia anteriorly, unicolorous, sometimes tinted with orange; scutellum sordid stramineous, with the Y-shaped callosed carina paler and with a whitish pruinose spot at base on either side; corium darker, somewhat ferrugino-fuscos; connexivum with narrow edge, except at incisures, the transverse fasciae outwardly narrow widely expanded within, ferrugino-fuscos; legs stramineous, not spotted but banded with black, the femora with six rings, the tibia with three rings before the middle; sternum and venter not fasciate, the latter with a small round black spot on segments two to six, situated midway between spiracles and middle of venter. Head, antennae and rostrum of the same character as in *cinctus*, the first named however not so abruptly contracted to form the collum which appears somewhat shorter. Pronotum much more setose than in *cinctus*; anterior angle with a prominent, bluntly rounded tubercle directed obliquely forward and set with a seta; posterior angle armed with a prominent horizontal subacute tooth or spine which is directed backwards on a line with the outer margin, sometimes infuscated at tip; anterior lobe with 10 to 12 prominently elevated, rounded tubercles, each set with a long seta; posterior lobe on the elevated disk granulate or provided with numerous scattered low tubercles beset with setae; the disk not so sharply delimited laterally as in *cinctus*; posterior margin before scutellum weakly bi-sinuate. Scutellum a little more widely foliaceous than in *cinctus*. Corium with a rather dense coating of fine appressed hairs. Membrane brownish hyaline. Connexivum rather widely expanded and reflexed; extreme edge fuscous except just before incisures which are somewhat callosed; the transverse fusco-ferrugineous fascia narrow where it joins the margin just back of the incisures, widely expanded within. Terminal genital segment of the male entire, slightly produced at apex in a short, stout, rather obtuse process, the posterior margins either side of process plainly callosed; the projecting genital lobes nearly straight, scarcely clubbed at apex, outwardly black.

Length male: 11 mm.; width of abdomen 4.5 mm.

Habitat.—Type: male Keatchie, La., VI, 14, 1905 (U. S. N. M. coll. La. Crop. Pest Comm.). Paratypes: males—Chain Bridge, Va. (U. S. N. M., D. H. Clemons Coll.); Boulder, Colo., Mch., Texas (U. S. N. M.); Plummer's Is., Md., IV, 5, 1914 (Coll. W. L. McAtee); La Hunta, Colo. (Osler—my coll.): females—

Willis and Gurley Tex., VI, 9, 1905 (U. S. N. M.); Plummer's Is., Md., VII, 27, 1913 (my coll. from W. L. McAtee).

Type and paratypes.—Cat. No. 27156 U. S. N. M.

This species is most closely related to *tuberculatus* Champion, from which it differs much in coloration. The femora are not spotted but only annulate with fuscous. In some specimens the anterior lobe of pronotum is tinted with orange and the connexivum beneath is occasionally transversely fasciate with fuscous.

Key to U. S. Species of Pselliopus.

1. Femora speckled and annulate with fuscous, tibiae annulate throughout. Anterior lobe of pronotum furnished with rather long, acute spines; posterior lobe with scattered small, black tubercles; the two anterior pronotal spines rather slender, directed forward (Mexico, Ariz., Nev., Calif., Ore., and Wash.) *spinicollis* Champ.
Femora only annulate with fuscous. Anterior and posterior lobes of pronotum either unarmed or provided with tubercles; the two anterior pronotal spines stout, directed obliquely forward 2.
2. Anterior lobe of pronotum quite setose, furnished with 10-12 prominent rounded tubercles; posterior lobe with numerous small setose tubercles or granules. Tibia annulate toward base only. Connexival fascia widely expanded within (Md., Va., La., Tex., Col.) . . . *latifasciata* n. sp.
Anterior and posterior lobes of the pronotum smooth, unarmed . . . 3.
3. Process of the genital segment of male subacute or divided at apex. Head, anterior lobe of pronotum, pleurae and venter strongly fasciate with fuscous, posterior lobe of pronotum commonly reddish; anterior median longitudinal sulcus extended past middle of posterior lobe as a shallow groove; posterior margin before scutellum very feebly bi-sinuate, nearly straight; humeral tooth well developed (C. Amer., Mex., Ariz., Calif.) . . . *zebra* Stal.
Process of the genital segment of the male entire. Deep median, longitudinal groove of the anterior lobe of pronotum, not at all or only faintly indicated on the posterior lobe 4.
4. Lateral angles of the pronotum unarmed, either nodose or rounded; posterior margin before scutellum strongly bi-sinuate. Genital process stout, not much produced (Mex., Ariz.) *inermis* Champ.¹
Lateral angles of the pronotum provided with either a subacute black tubercle or a spine; posterior margin more feebly bi-sinuate 5.
5. Lateral angles of pronotum provided with an obvious, subacute spine which projects beyond humeral angles. Anterior lobe of pronotum strongly trifasciate with black; posterior margin before scutellum quite evidently bisinuate. Genital process of male rather stout and blunt not spinose (U. S. east of Rocky Mts.) *cinctus* Fab.

¹Specimen from Huachuca Mts., Ariz., in my collection, with pronotum fasciated as in Chihuahua specimen mentioned by Champion, B. C. A. p. 247.

Lateral angle of pronotum provided with a short, stout, usually acute, black tubercle which does not project beyond the humeral angles. Anterior lobe of pronotum non-fasciate; posterior margin before scutellum quite or very nearly straight. Genital segment of male armed with a rather long, erect, spinous process (East states from Md. to So. C., west to Kans., and south to La. and Tex.) *barberi* Davis.

ON THE CORRECT NAME FOR THE BROWN-TAIL MOTH.

BY WM. BARNES AND F. H. BENJAMIN, *Decatur, Illinois.*

Both Rothschild, 1917, Nov. Zool., XXIV, 355 and Swinhoe, 1922, Ann. & Mag. Nat. Hist., (9), X, 480 have called attention to the fact that the Brown-tail Moth usually known as *Euproctis chrysorrhoea* Linn. should be called *Nygmia phaeorrhoea* Donovan.

Lord Rothschild clearly proves that *Euproctis chrysorrhoea* Linn. is not applicable to the Brown-tail Moth, but to the Gold-tail moth, another common European pest, which has previously been known as either *Porthesia similis* Fuessl. or *auriflua* D. & S. (Fabr.). The name *auriflua* Esp. (1785) occasionally applied throughout the early literature to the Brown-tail Moth is either a homonym of *auriflua* D. & S. (1776) (both having been placed in *Bombyx*), a misuse of the name, or a misidentification of the name, in any case unavailable nomenclatorily.

The genus *Nygmia* Hubner, type *Phalaena (Bombyx) icilia* Stoll., designated by Kirby, 1892, Syn. Cat. Lep. Het., p. 448, appears to have priority, as stated by Rothschild and Swinhoe. Judging from Swinhoe's Revision, Kirby's Catalogue, and Hampson's Fauna Brit. Ind. the following genera are congeneric, in a broad sense: *Urocoma* H.-S. (type *limbalis*); *Lacipa* Wlk. (type *picta*); *Artaxa* Wlk. (type *guttata*); *Antipha* Wlk. (type *costalis*); *Dulichia* Wlk. (type *fasciata*); *Lopera* Wlk. (type *squamosa*); *Arna* Wlk. (type *apicalis*); *Somena* Wlk. (type *scintillans*); *Uitidava* Wlk. (type *incomptaria*); *Cozola* Wlk. (type *leucospila*); *Adlullia* Wlk. (type *lunifera*); *Themaca* Wlk. (type *comparata*); *Orvasca* Wlk. (type *subnotata*); *Bembina* Wlk. (type *apicalis*); *Microgymna* Wallgrn. (type *picta*); *Gogana* Wlk. (type *atrosquama*); *Chaerotracha* Felder (type *atrosquama*); and *Tephothrix* Holland (type *lanaria*).

Most of these genera are either monotypic or have the type designated by their author. Where such is not the case, Kirby and Swinhoe agree except in the case of *Nygmia*, the type of which is listed by Swinhoe as *phaeorrhoea* which is not an included species; and *Chaerotracha*, the type of which is listed by Swinhoe (1922) as *conspersa*, an *ultra vires* designation, Kirby (1892) having designated *atrosquama* as type, possibly because listed by Felder as a synonym of *glandulosa*, but probably for synonym *glandulosa*.

NORTH AMERICAN SPECIES OF *FERDINANDEA* (DIPTERA: SYRPHIDAE).BY RAYMOND C. SHANNON, *U. S. Bureau of Entomology.*

All the types of the American species of *Ferdinandea* (= *Chrysoschlamys*) which have been previously described are in the Museum of Comparative Zoology, Cambridge, Mass. The writer wishes to thank Mr. Samuel Henshaw and Mr. Nathan Banks for the opportunity of examining them and other types of the Osten-Sacken-Loew collection upon which it is intended to base certain other writings.

The species of this genus are very closely related. The number of thoracic bristles affords good diagnostic characters and as their use simplifies the determination of the species they have been added in the key. The male genitalia are so similar among the species that they can be used with little advantage.

The chaetotaxy of the genotype, *cuprea* Scopoli (European), is here given. Four notopleurals; three supraalars; one intraalar; 1 postdorsocentral; 1 postacrostichal; 4 postalars; ten marginal scutellars; four mesopleurals. It differs chiefly from our species by the possession of the intraalar.

- A. Four notopleurals; abdomen entirely bright bronze-green; petiole beyond first posterior cell as long as discal crossvein. (Western U. S. and Canada) *croesus* O. S.
- AA. Three notopleurals; post margins of second and third tergites opaque black; arista yellowish; petiole beyond first posterior cell shorter than discal crossvein. (Oregon, New Mexico?) . . . *aeneicolor* n. sp.
- AAA.¹ Two notopleurals; post margins of second and third tergites opaque black¹; arista yellowish basally; petiole about as long as discal crossvein.
 - B. Six scutellars; facial spot indistinct in outline; fore femora and tips of all tarsi dark brown. (Va., N. J., Pa., N. Y.) *buccata* Loew
 - BB. Eight or more scutellars; face in middle with a V-shaped black mark.
 - C. Legs reddish yellow. (East of Miss. R.) . . . *dives* O. S.
 - CC. Femora and tibiae brownish. (Mass., N. H.) . . . *nigripes* O. S.

***Ferdinandea aeneicolor*, new species.**

Male.—Head a little broader than high; ocellar triangle with black loose pile; frontal triangle with silvery pruinescence and pile except along anterior margin; antennae moderate, dark brown except lower portion of third joint which is yellowish; third joint subquadrate; arista reddish yellow, darker apically, longer than length of antennae; face yellow with pollen and pile except on the broad

¹The type female is a teneral specimen and faint traces of the dark borders can be seen in good reflected light.

and shining brown tubercle. Mesonotum dark aeneous with two longitudinal grayish pollinose vittae; pile yellowish and black intermixed; one postacrostichal; one postdorsocentral; three notopleurals; three supraalars; three postalars; eight marginal scutellars; four mesopleurals. Femora brown, yellowish apically; fore tibia brownish; tips of all tarsi brown. Post margins of second and third tergites opaque black, on second tergite the black extending as a slender prolongation to anterior margin. Wings smoky, a distinct cloud in middle of wing and another on the discal crossvein. Squamae and halteres yellow. Length 11 mm.; wing 10 mm.

Type.—Cat. No. 27261 U. S. National Museum. One male, Forest Grove, Oreg., Sept. 18, 1919 (L. P. Rockwood).

A male specimen from Pecos, N. Mex., June 15 (Graham) agrees in all characters noted above and is provisionally placed with this species.

Dr. F. R. Cole informs me that he has this species in his collection, also from Oregon.

A NEW SAWFLY OF THE FAMILY XYELIDAE (HYMENOPTERA).

By S. A. ROHWER, U. S. Bureau of Entomology.

Odontophyes bicoloripes, new species.

This interesting species differs from the genotype, *Odontophyes avingrata* (Dyar), in the partly rufous legs and mesepisternum.

Female.—Length (to the end of abdomen), 7.5 mm.; length of ovipositor 1.5 mm. Frons coriaceous on a granular surface; middle fovea obsolete but replaced by an impressed line from the anterior ocellus; vertex and orbits finely granular; postocellar and vertical furrows obsolete; fourth antennal joint one-fifth longer than the fifth; thorax above granular; tergites, except the apical one, finely transversely aciculate; sheath straight below, acute at apex, regularly convex to base. Black, with a strong, metallic, blue luster on the tergites and with a faint cupreous luster on the head and thorax; clypeus, mandibles and tegulae stramineous; mesepisternum, sternum and basal sternites rufous; legs rufous except the apices of the hind femora, the entire hind tibiae and basitarsi; posterior trochanters and the four apical joints of the hind tarsi white; wings hyaline, venation dark brown.

Type locality.—Agricultural College, Mississippi.

Described from a single female collected April 6, 1915, by A. E. Barbarin. Received for identification from M. H. Smith, of the Mississippi Agricultural College.

Type.—Cat. No. 26040 U. S. N. M.

THE GENERIC NAMES OF THE CLOVER AND ALFALFA WEEVILS HYPERA AND PHYTONOMUS.

BY H. S. BARBER, *U. S. Bureau of Entomology.*

An editorial footnote in the Review of Applied Entomology, volume 12, Series A, page 24, reads:

"The name *Phytonomus*, Schh., is an absolute synonym of *Hypera*, Germ., and therefore cannot be used for any division of that genus. In any case, there is no really satisfactory line of division between the winged and wingless species of *Hypera*.—Ed."

An examination of the original publications of the two genera substantiates the conclusions of Titus 1911 (Ann. Ent. Soc. Amer. vol. 4, p. 386), except that the writer believes *Hypera* to be valid in 1817 instead of 1821, for if modern systematists can establish new genera by designating a described species as genotype, we can hardly object to the establishment of genera a century ago by authors listing the known species to be included in the proposed new genus. *Curculio punctatus* is an originally included species and its designation as type of *Hypera* by Curtis (1826), together with Schoenherr's designation of *Rhynchaenus polygoni* as type of *Phytonomus* in the original description the same year, 1826, has been discussed by Titus.

Through increased knowledge our concepts of groups change, and genera may be united through intergradient species, but the opposed opinions here evident probably result from divergent methods of consideration—the Linnaean idea of delimiting a genus by characterization as opposed to the more recent practice of selecting one species as type of a genus. In our present state of systematic uncertainty the grouping of related species about a nucleus, or genotype, induces a better concept of relationship than can be obtained by a consideration of the constantly changing limits assigned to genera in their successive treatments. *Hypera* and *Phytonomus* would perhaps be "absolute synonyms" if considered on the basis of the original group of species but the designation of their genotypes almost a century ago demands a different procedure. If genera have identical genotypes their genonyms are *absolute* synonyms; if genotypes are congeneric (*sensu stricto*) their genonyms are synonyms, but if the genotypes fall into different specific groups, as appears to be the case with *punctata* and *polygoni*, the genonyms should be retained for those subgeneric groups until our concepts of classification change.

If the editor responsible for the footnote in question knows unstated facts invalidating Titus' conclusions it is hoped that he will have them put on record.

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**TWO NEW SPECIES OF CEUTHOPHILUS FROM THE CARLSBAD
CAVE IN NEW MEXICO (ORTHOPTERA).**

BY A. N. CAUDELL, *U. S. Bureau of Entomology.*

The extensive caverns at Carlsbad, New Mexico, known as the Carlsbad Cave, were visited during the present year by an expedition under the auspices of the National Geographical Society. Mr. Vernon Bailey, of the Biological Survey of the U. S. Department of Agriculture, was a member of this expedition and at his invitation Mr. O. G. Babcock, of the Federal Bureau of Entomology, accompanied the party. Mr. Babcock's assigned duties were to collect insects in the caverns, which he assiduously did, the Orthoptera secured being submitted to the writer for determination. In addition to the material collected by Mr. Babcock there were also received a couple of specimens collected in the cave by Mr. Bailey.

All the above material, twenty-two specimens in all, comprises but two species, both belonging to the genus *Ceuthophilus*, and neither apparently hitherto described. They are therefore herein characterized as new species.

***Ceuthophilus carlsbadensis*, new species.**

Description.—♂ and ♀. A medium sized unicolorously brown species. Head smooth, vertex without horn-like projection, being almost entirely smooth; eyes black, pyriform, the point ventral. Pronotum smooth.

Legs rather short and stout; fore femora noticeably longer than the pronotum and armed on the inner ventral margin with four or five distinct spines, the opposite margin entirely unarmed; middle femora armed beneath on each margin with four to six spines and above with a long genicular spine on the hind margin; hind femora in both sexes somewhat over three times as long as broad, the apical fifth only parallel, and armed beneath on both margins for almost the entire length with numerous short sharp triangular teeth, no longer than the basal width; above in the apical half these femora are furnished with numerous acute posteriorly directed spinule-like tubercles and the ventral sulcus is moderately broad; fore and middle tibiae in both sexes armed beneath with four pairs of spines inclusive of the apical ones, the anterior pair unarmed above, the intermediate pair with a single median pair of spines and sometimes with one or two additional ones, and the posterior ones, which are straight in both sexes, with a single median subapical ventral spinule; the dorsal spines of the hind tibiae, of which there are five pairs, diverge very noticeably, are decidedly longer

than the width of the tibia and are separated by spaces approximately twice their length; the inner apical calcars are longer than the outer ones, the median ones the longest, the inner median one being one-half as long as the posterior metatarsus; tarsi long, those of the fore and middle legs about two-thirds as long as the tibiae and those of the hind legs one-half as long as the tibia; posterior metatarsus approximately as long as the rest of the segments together, the second segment twice as long as its apical depth and about twice as long as the third segment.

Abdomen smooth in both sexes; ninth dorsal segment in the male, as viewed from above, completely hidden beneath the eighth, which is apically prolonged above and slightly beyond the ninth and with the apex truncate and rather conspicuously swollen; supraanal plate of both sexes small, triangular; depressed; subgenital plate of male large and subquadrate, the apex deeply notched triangularly, the lateral angles thick and broadly rounded, of the female small, triangular with the apex rounded and entire; cerci of both sexes simple, about as long as the pronotum and twice as long as the femoral width; ovipositor short, the ventral teeth of the inner valves five in number, counting the apical curved ones, the terminal three the longer and all rather slender, almost entirely chitinized and sharply pointed, the outer valves at the apex on the dorsal margin with a short sharp chitinous upwardly and posteriorly directed point.

Measurements.—Length, total from front of head to end of abdomen, ♂ and ♀, 15 mm.; pronotum, ♂ 4, ♀ 4.75 mm.; anterior femora, ♂ 6, ♀ 7 mm.; posterior femora, ♂ 10, ♀ 11 mm.; posterior tibiae, ♂ 11, ♀ 12 mm.; ovipositor, 6 mm. Width, posterior femora at widest part, ♂ 2.3 mm., ♀ 3 mm.

Type, Allotype and Paratypes.—Cat. No. 27476 U. S. N. M.

Habitat.—Carlsbad Cave, Carlsbad, New Mexico.

Described from seven specimens, one adult male, three adult females, and three male nymphs, as follows: type male, and allotype female (both adults), April 24, 1924, bearing the collector's No. 11241; Paratype A, adult female, Apr. 26, Coll. No. 11512; Paratype B, adult female April 23, Coll. No. 11239; paratypes C, D and E, immature males, same data as the type and allotype.

Structurally this uniformly somber colored species seems the most nearly allied to the eastern *C. nigricans*. There are a number of very distinct characters, however, which will serve to separate the opaque unicolorous western form from its shiny brown and usually dorsally striped eastern relative. Thus *nigricans* has but one ventral spine in the inner margin of the fore femora, rarely two, the teeth of the ovipositor are less chitinized and not quite so sharp, the posterior tarsus is but about one-third as long as the corresponding tibia, the middle apical calcar on the inner side of the hind tibia is two-thirds or more as long as the posterior metatarsus and the subgenital plate of the male is apically entire or, usually, briefly triangularly impressed, all of which characters differ from those of the species above described.

The male of *carlsbadensis* also seems somewhat allied to *aridus* Bruner as described by the author of that species; *aridus*, however, has the cerci no longer than the greatest width of the posterior femora while in *carlsbadensis* they are twice as long, and the posterior tarsi are about one-third as long as the corresponding tibia instead of about one-half as long as they are in the cave species. There does not appear to be much resemblance between *carlsbadensis* and the species described under the specific name *ensifer* by Packard from the Nickajack Cave in Tennessee. This latter species, females only of which are known, has been recorded from New Mexico,¹ but probably wrongly so, though just what species was involved is unknown.

As the exact data given in the collector's notes accompanying the insects taken in the Carlsbad Cave may later prove of some value and interest, it has been thought best to include them in the present paper. The notes covering the material comprising the above species are as follows:

11239. "Two crickets; the light colored one² taken from between "Devil's sink hole"³ and Kings Palace; the dark colored one near "Devil's sink hole, April 23." (Two females in this lot.)
11241. "April 24, crickets taken from walls and floor of Cavern between first and second shaft. One large and one young cricket observed on cactus rat carcass that was placed in cave as bait. The young cricket was apparently feeding." (One adult pair and three nymphs.)
11512. "April 26, 1924. Crickets collected about 50 ft. east of West shaft. Depth 170 ft." (One adult female.)

***Ceuthophilus longipes*, new species.**

Description.—♂ and ♀. A very long slender-legged medium-sized species of a uniform yellowish brown color. Head with vertex scarcely at all swollen, without any horn-like projection; eyes black, pyriform, the point ventral, the sides straight, or slightly concave. Pronotum smooth. Legs unusually long and slender; fore femora fully twice as long as the pronotum and wholly unarmed above and beneath, without even genicular spines; middle femora also unarmed beneath but above furnished with a long genicular spine on the caudal margin; hind femora very slender, being about six times as long as broad and with about the apical third subparallel, beneath in both sexes entirely unarmed on both margins, the intervening sulcus very narrow, the lateral carinae in basal part almost or quite meeting, and above the surface is smooth, without any raised points in either sex; fore tibiae unarmed above except for the apical spines and beneath armed with three pairs of spines in addition to the apical ones, the first pair situated about the middle, one near the apex, and one pair between the others, a little nearer the subapical pair; intermediate tibiae armed above with a

¹Scudder & Cockerell. Proc. Davenp. Acad. Sci., vol. ix, p. 56 (1902).

²The "light colored one" mentioned here refers to the second species, as described below.

³More commonly known as the "Devil's Den."

single pair of spines just beyond the middle, of which one on the caudal margin is often missing, and beneath armed as in the anterior ones; posterior tibiae decidedly longer than the corresponding femora, straight in both sexes, armed beneath near the distal end with a single small median spine and above with four pairs of spines in addition to the apical ones, the spines very moderately divergent and about twice as long as the tibial width; the apical calcaria are long, the inner ones a little longer than the outer ones, the median ones much longer than the others, the inner median one twice as long as the dorsal one on that side and three times as long as the ventral one, being approximately one-half as long as the posterior metatarsus. Tarsi very long and slender, the anterior and intermediate ones about two-thirds as long as their tibiae and the posterior ones about one-half as long, the metatarsi longer than the other segments together and the second segment of the hind tarsus about four times as long as the apical depth and twice as long as the third segment. Abdomen smooth in both sexes, showing no dorsal roughness of any kind; ninth dorsal segment in the male, as viewed from above, extending distinctly beyond the eighth segment, apically briefly extended and very broadly rounded with the posterior margin very slightly concave mesially; seventh and eighth dorsal segments very slightly tectate and posteriorly very gently produced; cerci simple, somewhat longer than the femoral width and strongly swollen in the basal half; supraanal plate mostly concealed in both sexes, apparently small and flat; subgenital plate of male large and broad, posteriorly very broadly and shallowly notched, of female small, transverse, apically rounded; ovipositor rather long and slender, almost three times as long as the pronotum, the outer valves apically terminated by a sharp upwardly and backwardly directed point and the inner valves each with four slender sharp teeth in addition to the apical decurved hook.

Measurements.—Length, total from front of head to end of abdomen, ♂ and ♀, about 14 or 15 mm.; pronotum, ♂, 3, ♀, 3.5 mm.; anterior femora, ♂ and ♀, 7.25 mm.; posterior femora, ♂ and ♀, 12 mm.; ovipositor, 10 mm.; width, posterior femora at widest point, ♂, 2, ♀, 2.1 mm.

Type, Allotype and Paratypes.—Cat. No. 27477 U. S. N. M. Paratypes (A and B) also in U. S. Biological Survey.

Habitat.—Carlsbad Cave, Carlsbad, New Mexico.

Described from fifteen specimens, six male and seven female, apparently adult and one male and one female nymph, as follows: type and allotype, adult male and female, April 23, 1924, collected by O. G. Babcock and bearing collector's No. 11508; paratypes A and B, adult male and female with same data as type and allotype; paratype C and D, adult and half grown nymph females, same data as type and allotype but with No. 11511; paratype E, adult female, same locality on April 24 and with No. 11242; paratype F, same locality data as type and allotype but with No. 11239; paratype G, immature male, probably in first stage, from same locality as the rest and bearing No. 11230; paratypes H, I, J, K, L and M, two males and four females, all adults from the same locality as the rest but taken by Mr. Vernon N. Bailey and bearing no collector's number.

The egg of this insect, one of which was taken from the abdomen of the female collected by Mr. Bailey, is yellowish in color, measures 3 mm. in length by 1 mm. in width and is a little thicker at one end.

This species, some specimens of which were taken in the furthest recesses at which insect life was found and all well beyond the light-penetrated regions of the cavern, does not appear very closely allied to any described form of the genus. The long slender legs are somewhat suggestive of *C. ensifer* Packard but this is a decidedly smaller form with a proportionately much longer ovipositor. The long legs also calls rather vaguely to one's mind the species of the genus *Hadenocetus*, but the legs in that genus are conspicuously more elongate than in the present insect and the terminal palpal segment is cleft only apically in dried material, in the present insect that segment being cleft on the apical three-fourths, as in all the species of *Ceuthophilus*.

The collector's notes on the specimens comprising this species are as follows:

- 11230. "Young cricket taken from a point beyond the Devils Sink Hole in absolute darkness. April 23." (A male nymph, probably first stage.)
- 11239. This number covered both the above described species and is entered under the first, which see.
- 11242. "April 24, '24. Pale cricket taken midway between 1st and 2d shaft. Cricket quite active." (One adult female.)
- 11508. "April 23, 1924. Crickets collected in Carlsbad cavern between west opening and west shaft." (Two adult pairs.)
- 11511. "April 23, 1924. Crickets collected from walls and floor of King's Palace. This is the furthest and darkest point where insect life was found." (Two females, one an adult and one a half grown nymph.)

Regarding the habits of the above described crickets Mr. Bailey writes that they are abundant throughout the cave, even to the furthest corners miles from any trace of light. They were usually crawling along on the floor or hidden beneath rocks, or in crevices, etc. The very long antennae were always extending out ahead when the insects moved. They ate scraps of discarded luncheons, fresh meat placed as bait for other insects and rolled oats used as bait for mice.

CHANGE OF NAME (HYMENOPTERA).

By R. A. CUSHMAN, U. S. Bureau of Entomology.

I find that my *Ephialtes (Itopectis) pacificus* is preoccupied by *Ephialtes pacificus* Harrington, and therefore rename it *Ephialtes (Itopectis) esuchus*, new name.

THE IDENTITY OF NEMICROMELUS FULVIPES (FORBES), A COMMON HESSIAN FLY PARASITE (HYMENOPTERA).

By P. R. MYERS, U. S. Bureau of Entomology.

The following information on this chalcidoid parasite is submitted for publication in order permanently to fix, if possible, the identity of this common Hessian fly parasite. It frequently has been referred to in literature under two specific names which at various times have been placed in six different genera.

The author hereby acknowledges his indebtedness to Dr. S. A. Forbes for information which made it possible definitely to fix the specific synonymy. The author's thanks are also due Mr. A. B. Gahan for useful information and helpful criticisms of which he has availed himself in the preparation of this paper.

Family PTEROMALIDAE.

Nemicromelus fulvipes (Forbes).

- Pteromalus* ? *fulvipes* Forbes, 14th Rept. State Ent. Ill (1884) 1885, p. 47-48.
Pteromalus fulvipes Packard, Amer. Nat., vol. 19, 1885, p. 1105.
Merisus fulvipes Cresson, Syn. Hym. N. A., 1887, p. 242.—Dalla Torre, Cat. Hym., vol. 5, 1898, p. 90.—Smith, Ins. N. J. (1909) 1910, p. 642.
Merisus (*Homoporus*) *subapterus* Riley, Proc. U. S. N. M. vol. 8, 1885, pp. 416-417, pl. xxi, fig. 2.—Packard, Amer. Nat., vol. 19, 1885, p. 1104.—Riley, Proc. Amer. Assoc. Adv. Sci. (1885), vol. 34, 1886, pp. 332-334.
Merisus subapterus Lindemann, Bull. Soc. Imp. Nat. Moscou (2) I, 1887, p. 178-192.—Cresson, Syn. Hym. N. A., 1887, p. 242.—Viereck, Conn. Geol. and Nat. Hist. Sur. Bull. 22, 1916, p. 480.
Baeotomus subapterus Marchal, Ann. Soc. Ent. Fr., vol. 66, 1897, p. 81.—Osborn, U. S. D. A., Div. Ent., n. s. Bull. '16, 1898, pp. 28, 32.—Felt, 17th Rept. N. Y. State Ent., Bull. St. Mus. 53, 1902 p. 721, fig. 3.—Webster, U. S. D. A. Bur. Ent. Cir. 70, 1906, pp. 12-13.—Felt, 28th Rept. N. Y. State Ent., 1913, p. 40.—Webster, U. S. Farmers' Bull. 640, 1915, pp. 16, 20, fig. 17.
Homoporus subapterus Dalla Torre, Cat. Hym., vol. 5, 1898, p. 91.—Smith, Ins. N. J. (1909) 1910, p. 642.
Micromelus subapterus Ashmead in Smith's Ins. N. J., 1900, p. 558.—Kurdiumov Entom. Vestnik, vol. 2, no. 1, 1913, pp. 1-4.—Fyles, Ont. Ent. Soc. Rept. No. 46, 1916, p. 56.—Packard, C. M., Jour. Agr. Res., vol. 6, 1916, pp. 367, 377-381.—McColloch, Kans. Exp. Sta. Tech. Bull. 11, 1924, pp. 63-72.
Nemicromelus subapterus Girault, Descriptiones Hymenopterorum Chalcidicarum Variorum cum Observationibus, V, Aug. 8, 1917, p. 4.

In 1885, Dr. C. V. Riley described a species of Hessian fly parasite under the name *Merisus* (*Homoporus*) *subapterus*. During this same year Dr. S. A. Forbes also published a description of a Hessian fly parasite under the name *Pteromalus* (?) *fulvipes*. Both of these descriptions were found later to apply to the same species and accordingly Cresson listed the two names separately under *Merisus* but indicated they were

synonymous although he did not state which name had priority. Dalla Torre listed the species as *Merisus fulvipes* and also as *Homoporus subapterus*, the latter with *Pteromalus fulvipes* cited as a synonym. Marchal, Osborn, and other authors later referred to the species as *Bacotomus subapterus*. Ashmead placed it in *Micromelus* Walker and Kurdiumov, Fyles, C. M. Packard and McColloch have followed Ashmead. In 1917, Girault erected the genus *Nemicromelus* and cited *Merisus subapterus* Riley as the genotype which he said equaled *fulvipes*.

Recently, in the course of the preparation of a paper on the parasites of the Hessian fly, the question arose as to which should be the proper specific name for this species, *subapterus* or *fulvipes*.

The author realizing that the correct specific name for this parasite depended upon the actual dates of the publication of the descriptions of *Pteromalus fulvipes* and *Merisus subapterus* within the year 1885, wrote to Mr. A. B. Gahan of the Bureau of Entomology, in order to learn, if possible, the actual dates of their publication. To this letter Mr. Gahan replied as follows:

"The question of priority as between *fulvipes* (Forbes) and *subapterus* (Riley) is not an easy one to answer. Riley's species was described in Proc. U. S. N. M., Vol. 8, p. 416, 1885, and the actual date of publication of this part of the volume was October 3, 1885. The description of *fulvipes* (Forbes) appears in the fourteenth Report of the State Entomologist of Illinois, p. 47. This report is for the year 1884, but was published in 1885, and I am unable to determine the exact date of publication. I find that both papers were reviewed in the American Naturalist, Vol. 19, November, 1885, p. 1104. This review is the only one that I can find which gives any key to the time of appearance of Forbes's paper. It appears, however, that Osborn and Dalla Torre, and perhaps others, have listed *fulvipes* as a synonym of *subapterus*. Perhaps they had definite information as to which name was earlier. If you find any information which will establish definitely which name was first published, I should be glad to be made acquainted with it."

Upon receipt of this reply which did not fully satisfy the author, he wrote to Dr. Forbes, inquiring the actual date of his description of *Pteromalus fulvipes*. Dr. Forbes replied as follows:

"I have looked through my office letter files for 1885 and find definite evidence as to the date of publication of my 3d report, the 14th of the State Entomologist's Office.

"The earliest acknowledgments which I find of receipt of copies are from G. H. French of Carbondale, Illinois, September 2, 1885; F. M. Webster, then at Purdue University, September 3d; Professor N. H. Winchell of Minneapolis, Minnesota, September 11th; Dr. J. A. Lintner, Albany, N. Y., September 14th, all antedating Riley's paper which bears the publication dates of September 14th and 17th for parts one and two respectively.

"I find also under date of September 16th a request for the 13th and 14th reports of the State Entomologist's Office from the State Library of Massachusetts, showing that a knowledge of the appearance of the 14th report had begun to become general by that date.

"I am enclosing these letters, which you will kindly return when you have verified their dates."

Upon the receipt of this interesting and valuable information the writer submitted his evidence to Mr. Gahan, in response to which he replied as follows:

"Your registered letter of March 1 received, and I was very glad to see the interesting correspondence sent by Dr. Forbes. The evidence he submits seems to be very conclusive that the description of *Pteromalus fulvipes* Forbes antedates the description of *Merisus subapterus* Riley. This being the case, of course *fulvipes* is the specific name which should be used."

"P. S.: Although the dates printed on the signatures in which Riley's description of *subapterus* appeared are Sept. 14th and 17th as Forbes states, the records in the office of Correspondence and Documents of the U. S. National Museum indicate that the papers were not received from the Government Printing Office until Oct. 3.

A. B. G."

Although the author regrets to see the name *subapterus*, which is so applicable to the species, give way to the name *fulvipes*, yet the change must be made, if the rule of priority is to be strictly adhered to, and credit given the one to whom it rightly belongs.

In view of the fact that Girault erected the genus *Nemicromelus* citing *Merisus subapterus* Riley as the genotype which has now proven to be a synonym of *Pteromalus fulvipes* Forbes, the proper name to be applied to this common species of Hessian fly parasite is *Nemicromelus fulvipes* (Forbes).

THE SYSTEMATIC POSITION OF THE GENUS *HARMOLITA* MOTSCHULSKY WITH ADDITIONAL NOTES (HYMENOPTERA).

By A. B. GAHAN, U. S. Bureau of Entomology.

Messrs. W. J. Phillips and W. T. Emery in 1919¹ published a "Revision of the Chalcid-Flies of the Genus *Harmolita* of America North of Mexico." Largely upon the advice of Mr. J. C. Crawford and the writer, the authors used the generic name *Harmolita* Motschulsky for this group of insects which constitutes the well known jointworms of grasses and grains previously going under the generic name *Isosoma* Walker. The name *Isosoma* was shown to be preoccupied, having been used by Billberg (1820) in Coleoptera. Dr. Ashmead, in his "Classification of the Chalcid Flies," had pointed out that Mot-

¹Proc. U. S. Nat. Mus. vol. 55, 1919, p. 443-471.

schulsky's genus was the same as Walker's. Being the oldest synonym it should therefore take the place of *Isosoma* Walker.

In 1920,¹ Dr. R. Hedicke, a German writer, published a contribution toward a monograph of the Palearctic Isosomini in which he treats the species under the Walkerian name, *Isosoma*, but in a supplemental statement at the end of the work, having seen Phillip's and Emery's paper in the meantime, he recognizes the preoccupation and invalidity of *Isosoma* Walker but refuses to accept *Harmolita* Motschulsky as a substitute and proposes a new name, *Isthmosoma*, to replace *Isosoma* Walker.

Hedicke's reasons for refusing to accept *Harmolita* seem to have been that Motschulsky placed his genus in the family *Pteromalidae* instead of *Eurytomidae* and since Motschulsky, in the same paper, described new Eurytomids, thus showing that he knew the differences between *Pteromalidae* and *Eurytomidae*, it followed that *Harmolita* could not be a Eurytomid and hence was not the same as *Isosoma* Walker. This sounds rather logical but unfortunately science and logic do not always agree. One has but to notice the genera which Motschulsky placed in his various subfamily groups to realize that his ideas of relationship were somewhat vague. In his group *Chalcidides* we find *Chalcis*, *Brachymeria*, *Eurytoma*, *Decatoma* and *Eucharis*; in his *Thorymides* are *Callimome*, *Marietta* and *Roptrocercus*; while in his *Pteromalides* we find *Cheiloneurus*, *Encyrtus*, *Anastatus*, *Harmolita*, *Pteromalus*, *Eulophus*, *Cirrospilus*, and *Tetrastichus*. One can hardly argue from this that Motschulsky was infallible as a classifier of *Chalcidoidea*.

Upon receipt of Hedicke's paper Mr. Phillips wrote me asking my opinion as to Hedicke's conclusion. After again looking up the original description I wrote Phillips stating that in my opinion Hedicke was wrong; that Motschulsky's figure and description indicated very clearly to me that the genotype species had nothing to do with *Pteromalidae* and so far as I could see left little doubt that Ashmead was right in considering the species congeneric with *Isosoma* Wlk. I stated that the figure is nothing more than a poor habitus sketch but the shape is exactly that of a male *Isosoma* and the description, although not very complete, tallies with *Isosoma*. I stated further that Hedicke's conclusion seemed to me to have been drawn without having seen the description; that he could very well have reasoned as he did from a consultation of Dalla Torre's catalogue but had he consulted the description of *Harmolita*, I did not see how he could have said what he did and that in my opinion *Harmolita* should stand as Phillips and Emery had used it while *Isthmosoma* Hedicke should be considered a synonym.

Very unexpectedly to me and quite unfortunately the contents of my letter were communicated to Hedicke. Quite

¹Archiv. f. Naturg. Jahrg. 86A, 11, p. 165.

naturally it did not meet with his whole-hearted approval. On the contrary there appeared in *Deutsch Entomologische Zeitung*, 1923, pp. 616-618, an article by Hedicke entitled "Der systematische Stellung des Genus *Harmolita* Motschulsky 1863" in which the author quotes largely from my letter to Phillips and emphatically reaffirms his opinion that *Harmolita* Motschulsky and *Isosoma* Walker are not the same and *Isthmosoma* should stand.

In this paper, Hedicke reviews his previously given reasons for believing *Harmolita* could not be a Eurytomid but in addition cites certain statements in the original description which according to his interpretation exclude it from the *Eurytomidae*. He points out particularly the shape of the pronotum and mesonotum which Motschulsky describes as follows: "pronotum coniquement atténué en avant, obliquement imprimé de chaque côté à angles antérieurs un peu saillants; mésonotum en triangle allongé." Hedicke states that this thoracic structure excludes *Harmolita* from the Eurytomines. On the contrary when interpreted in the light of Motschulsky's figure the description agrees very well with almost any species of the joint worm flies if one will simply assume that what was meant by mesonotum was the middle lobe of the mesonotum which is always prominent and distinctly triangular in this group. Hedicke also calls attention to Motschulsky's statement that the "veine costale atteignant le côté latéral un peu au delà du milieu de l'aile" and states that this too is never true of Eurytomines. The writer is prompt to admit that this character if correctly stated by Motschulsky is unusual for the Eurytomines but I believe not more unusual than it would be for the Pteromalines. Although unusual, it is not impossible even for the Eurytomines as may be shown by a male specimen of (*Isosoma*) *Harmolita bromi* How. in the national collection. In this individual the wings are a little shorter than usual and the costal vein attains the margin a little beyond the middle of the wing. In my opinion therefore the characters cited by Hedicke do not exclude *Harmolita* from the *Eurytomidae*.

On the other hand there are certain characters given by Motschulsky which in my opinion make it practically certain that *Harmolita longicornis*, the genotype species, is one of the joint-worm flies. The description of the antennae fits exactly that of a male *Isosoma* if it be admitted that Motschulsky overlooked the ring-joints. The description of the head and thorax if taken with the figure agrees with a male joint worm fly as does the shape of the abdomen and the distinct abdominal petiole. The thing above all others, however, which establishes beyond a reasonable doubt that *Harmolita longicornis* is identical with *Isosoma* of Walker and authors is the fact that the insect is black throughout with the exception that the anterior angles

of the pronotum are testaceous. I know of no other group of the Chalcidoidea in which this peculiar combination of color is found and in the joint worms it is the rule rather than the exception.

Perhaps the only way in which the identity of *Harmolita* can be established beyond a doubt will be for some one to examine the type specimen if this is still in existence. In the meantime it is my intention to continue to use *Harmolita* in place of *Isosoma* Walker.

In conclusion I must call Dr. Hedicke's attention to the fact that in attempting to correct the reference to the original description of *Harmolita* given by Gahan and Fagan in their genotype list of the Chalcidoidea,¹ which is admittedly wrong as to the year and which he makes the basis for the suggestion that one might suspect that the authors had not seen Motschulsky's diagnosis, he has himself committed a more serious error by citing the wrong volume, the correct citation being Bull. Soc. Nat. Moscow, vol. 36, pt. 2, 1863, p. 58 instead of vol. 35.

Very recently I received from Mr. T. Ishii of the Imperial Plant Quarantine Station at Nagasaki, Japan, specimens of two phytophagous species of Eurytomidae which proved of unusual interest. As the locality record is new for both species and the host plant record new for one it is worth while to make a note of them at this time.

***Harmolita phyllostachitis* Gahan.**

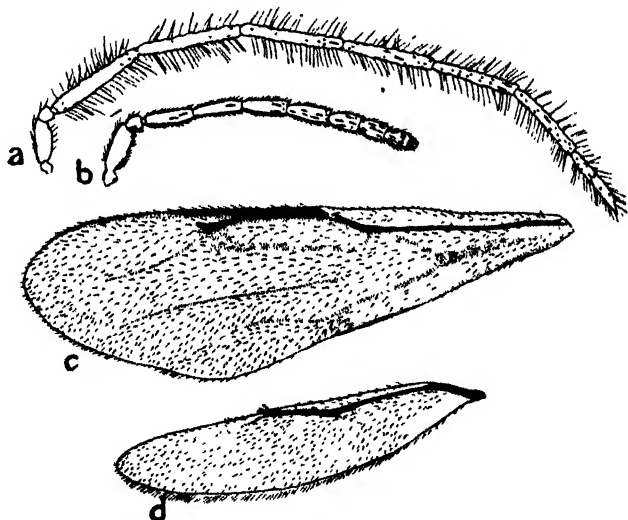
In 1922 (Proc. Ent. Soc. Wash. vol. 24, p. 55) the writer described *Harmolita phyllostachitis* from Brooksville, Florida, where according to records of the Department of Agriculture it was attacking and proving more or less seriously injurious to young shoots of bamboo (*Phyllostachys bambusoides*). At that time it was impossible to tell whether the species was a foreign importation which had become accidentally established in Florida or a native species which had recently taken up the habit of attacking bamboo. It was considered more likely that its presence in Florida was due to accidental importation but this could not be proven.

In the Ishii sending was a single female which he had tentatively determined as *H. phyllostachitis* and upon comparing it with the types I have no hesitancy in pronouncing it that species. The presence of the species in Japan indicates that country as the possible original source of the Florida infestation. At any rate *phyllostachitis* is certainly not a native of Florida. In all probability its original home was in China or Japan and it was established in Florida through the importation of infested bamboo cuttings for propagation.

¹Bull. 124 U. S. Nat. Mus., 1921, p. 69.

Aiolomorphus rhopaloides Walker.

This genus and species described by Walker in 1871 (Notes on Chalcid. pt. 1, p. 12) from a male specimen collected in the region of Hong Kong, China, apparently has not been mentioned in the literature since, except in catalogs. In the Ishii sending were two specimens, a male and a female, which my correspondent suggested seemed to be quite identical with Walker's species and after comparing the specimens with the description I am convinced that they are in fact that species. Mr. Ishii states that the species attacks the shoots of bamboo (*Phyllostachys bambusoides* and *P. mitis*) and is quite common in Japan. The national collection contains an additional female specimen taken at quarantine in Washington, D. C., January 25, 1923, from a box containing bamboo cuttings received by the Department of Agriculture from Nishighara, Japan.



Aiolomorphus rhopaloides Walker; a, antenna of male; b, antenna of female; c, forewing; d, posterior wing.

Aiolomorphus rhopaloides Walker is a close relative of some species of the genus *Harmolita* Motschulsky (the common jointworms of grains and grasses). It is remarkable for the presence of vestigial basal, median, radial, and other veins in the forewing (see fig. 1.). It differs from *Harmolita* also in having the parapsidal grooves deeply impressed anteriorly but entirely effaced on the posterior one-third of the mesoscutum, and in having in the female a 6-jointed funicle with a very short 3-jointed club. The abdomen of the female is more strongly

compressed from the sides than in most species of *Harmolita* and the fourth tergite is the largest. The male has unusually long antennae, these being very nearly as long as the whole body, 10-jointed with one ring joint, the first flagellar joint fully twice as long as the scape, following joints subequal to the first, the two apical ones very slightly shorter. The head and thorax in both sexes are rather coarsely shagreened with some indistinct umbilicate punctures, the face with convergent striae.

ON THE SYSTEMATIC POSITION OF THE GENERA COLLYRIA SCHIÖDTE AND ISCHNOCEROS GRAVENHORST (HYMENOPTERA).

By R. A. CUSHMAN, U. S. Bureau of Entomology.

In a paper on the "Holarctic Tribes of the Ichneumon-flies of the Subfamily Ichneumoninae (Pimplinae)"¹ Cushman and Rohwer eliminated the genus *Collyria* Schiödte from the subfamily Ichneumoninae and expressed the opinion that it should form a distinct subtribe in the tribe Mesoleptini, subfamily Tryphoninae. Further critical study of the genus, however, indicates that this conclusion is wrong and that the genus should more properly be restored to the Ichneumoninae.

In the tribal keys of Cushman and Rohwer, both in that based on females and in the general key, *Collyria* runs best to the tribe Odontomerini. In several of the key characters it resembles the Labenini: the form of the propodeum and first abdominal segment and the position of the insertion of the latter on the propodeum and the form of the hind coxae; but otherwise apparently has little in common with that tribe. The Odontomerini, on the other hand, it resembles in the swollen head with the eyes nonemarginate and distant from the mandibles, in the strong notauli, in the lack of the areolet and in the venation of the wings generally, in the stout hind femora, and somewhat in the form of the abdomen beyond the first segment.

But, in addition to the characters by which it resembles the Labenini, it differs from the Odontomerini in the incompletely areolated and mutic propodeum, the normal tibiae in the female, the form of the ovipositor, and the hairy eyes.

Were *Collyria* to be included in the Odontomerini it would destroy the homogeneity that characterizes that group; and I believe that the best disposition to be made of it is to erect a new tribe for its sole reception.

Tribe COLLYRIINI, new tribe.

The keys of Cushman and Rohwer cited above will have to be modified as follows for the inclusion of this tribe. Under the

¹Proc. U. S. Nat. Mus., vol. 57, 1920, p. 395.

second alternate of couplet 12 in the key to females insert the following couplet:

Propodeum completely areolated, the carinae, except sometimes the median, distinct, upper angles mucronate; middle tibiae stout and twisted; hind coxae short and thick; first abdominal segment arched above and strongly widened toward apex; eyes not hairy; ovipositor very long, slender, serrate at apex *Odontomerini*.

Propodeum incompletely and very faintly areolated, upper angles mutic and not at all defined; middle tibiae normal, slender; hind coxae very long and slender; first abdominal segment straight above and only slightly widened toward apex; eyes hairy; ovipositor short, rather deep, rather abruptly smaller near apex *Collyriini*, new tribe.

Under the first alternate of couplet 5 in the general key to tribes the following couplet should be inserted:

Propodeum completely areolated, the carinae, except sometimes the median, distinct, upper angles mucronate; eyes not hairy *Odontomerini*.

Propodeum incompletely and very faintly areolated, upper angles mutic and not at all defined; eyes hairy *Collyriini*.

Tribal characters.—Head large, swollen, temples broad, slightly sloping, their antero-posterior length nearly as long as that of eye; occiput concave, the carina distinct and complete; eyes rather small, distant from mandibles, beset with short hairs; clypeus separated, medially dentate; mandibles subequally bidentate; antennae slender, stouter beyond middle; thorax long, the propodeum very long and straight above from base to insertion of abdomen, which is above the hind coxae, only the longitudinal carinae present, these weak or obsolete, spiracles elongate oval, far from base; notauli deep; scutellum convex; areolet wanting; nervellus broken far above middle; legs long, rather slender except the rather stout hind femur, hind coxa very long, the femur short, claws falcate, neither pectinate nor dentate; abdomen in female elongate fusiform acute at apex, in male sublinear, first tergite straight, depressed, petiolate, slightly widening from base to apex, spiracles before middle; hypopygium far before apex of abdomen; ovipositor short, compressed, in profile rather suddenly smaller just before apex.

The typical and only included genus is *Collyria* Schiödte.

Genus COLLYRIA Schiödte.

Collyria Schiödte, Magas. de Zool., vol. 9, 1839, pp. 6-10, note.

Pachymerus Grav., Ichn. Eur., vol. 3, 1829, p. 721 (not Lepeletier).

Description.—The characters of the tribe.

Distribution.—Dalla Torre's "Catalogus Hymenopterorum" lists nine species. All but one of these are old world species. The one exception is *Collyria nigrolineata* Brullé of Guiana, which Krieger¹ has transferred to *Eiphosoma* and Morley² has synonymized with *Eiphosoma mexicana* Cress.

¹Zeits. Hym.-Dip., 1903, p. 291.

²Rev. Ichn. B. M., pt. 2, 1913, p. 54.

Tribe ODONTOMERINI Cushman and Rohwer.

Genus **ISCHNOCEROS** Gravenhorst.*Ischnoceros* Grav., Ichn. Eur., vol. 2, 1829, p. 949.*Mitroboris* Hlmg., Oefoers. Svensk. Vet.-Akad. Förh., vol. 16, 1859, p. 131.

Cushman and Rohwer (loc. cit.) did not know and failed to mention this genus in their reclassification of the Ichneumoninae. Since that time two specimens have come to the National Museum with the collection of the late Theodore Pergande. These are determined by Schmiedeknecht as *Ischnoceros cornuta* Ratz. Both run in Schmiedeknecht's key¹ to *flicornis* Kriechb., with which Schmiedeknecht synonymizes in part *Mitroboris cornuta* Ratz.

On the basis of these specimens it is perfectly obvious that the genus belongs to Odontomerini, being practically an *Odontomerus* without femoral teeth and with a frontal horn.

No American species are known.

SYNONYMICAL NOTES ON TWO SPECIES OF AULACASPIS (HEMIPTERA: COCCIDAE).

BY HAROLD MORRISON, U. S. Bureau of Entomology.

Exactly thirty years ago Prof. T. D. A. Cockerell (1)² described as a new species from the West Indies the diaspine scale insect *Chionaspis major*. This insect, after being referred to in literature by its describer and some others a few times, apparently dropped completely out of sight. Much more recently, Rutherford (2) described as new the species *Aulacaspis flacourtiae* from Ceylon, and this species was later redescribed and figured by Green and Laing (3). Mr. Green has subsequently very kindly verified the writer's identification of certain specimens from Cuba as being identical with Rutherford's species, and has furnished him with examples of it. Recently, while attempting to determine the identity of certain specimens collected by the Federal Horticultural Board, the writer became aware of the close resemblance in the pygidial characters of these two species, supposedly belonging to different genera, and on following up the initial examination by a comparative study of the material available, including type specimens of *Chionaspis major* Ckll., was forced to the conclusion that the two are identical. The insect, as was pointed out by Green and Laing in the paper cited, closely resembles the West Indian Peach Scale, *Aulacaspis pentagona* (Targ.), and this resemblance also exists in the scale,

¹Opusc. Ichn. vol. 3, p. 1347.

²Numbers in parentheses refer to literature cited at end of paper.

this not differing evidently, except in larger average size, from that of *pentagona* as this grows under some conditions.

The generic assignment and synonymy of this species will, for the present, stand as follows:

***Aulacaspis major* (Cockerell).**

Synonym.—*Aulacaspis flacourtiæ* Rutherford.

Distribution and Host Relationships.—Published records include Antigua, B. W. I., on Heliotrope; Ceylon, on *Flacourtia ramontchii*; Seychelles, on *Flacourtia*. Material in the National Collection of Coccidae includes the types, the Seychelles record, specimens from Hawaii on Litchi, collected by H. Y. Gouldman (F. H. B. No. 26945) and on *Nephelium longanum*, collected by Jacob Kotinsky; from Buitenzorg, Java, on *Ficus* sp., collected by R. S. Woglum; from Hong-Kong, China, on unknown plant, collected by Geo. Compere; from Costa Rica, on Pejibayes fruit, collected by H. Y. Gouldman (F. H. B. No. 43985); and from Oriente Province, Cuba, on *Cupania macrophylla*, collected by C. H. Ballou.

The close relationship of this species to *A. pentagona* suggests that it might develop into a pest of some importance if it became established in the subtropical regions of the United States.

The transfer of Cockerell's name *major* to the genus *Aulacaspis* creates a situation which is unfortunate, but which apparently can not be avoided. Since this transfer makes *Aulacaspis major* Rutherford (4), described from New Guinea on sugar cane, a homonym of Cockerell's older species, it becomes necessary to propose a new name for it, although such a change might not be necessary if the generic classification of the group to which these species belong had been properly worked out.

The writer therefore proposes the combination *Aulacaspis rutherfordi* as a new name for the species described as *Aulacaspis major* Rutherford.

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